The effects of socio-demographic factors on depression and perceived health status among a cohort of young people (15-24) in South Africa: evidence from the National Income Dynamics Study (NIDS) waves 1-5

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PLAGIARISM DECLARATION

This research is my original work, produced with supervisory assistance from my supervisor. I have used the Harvard convention for citation and referencing. Each contribution to this dissertation from the works of other people has been acknowledged, cited and referenced. In addition, this dissertation has not been submitted for any academic or examination purposes to any other university.

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ABSTRACT

Introduction: The prevalence of bad perceived health status and depression, their socio-demographic determinants (education level, employment status, relative household income, race, age and gender) and the modifying effect of depression on PHS have been investigated among a cohort of young adults using data from the South African National Income Dynamics Study (NIDS) waves 1-5. South Africa is a middle-income country, with very high levels of socio-economic inequality and a history of apartheid. Both depression and PHS tend to be affected by socio-demographic and environmental factors.

Methods: Depression was measured using the CES-D-10 scale and PHS was measured on a 5-point likert scale ranging from excellent to poor. A binary version of PHS was generated which groups the categories excellent, very good and good into good and the categories poor and fair into bad PHS. Descriptive analysis and Mixed Effects Regression analysis were conducted. MER is appropriate for unbalanced panels as this method is robust to irregularly spaced measurements.

Results: A high prevalence of depression was found in the study with about 13%-20% of the cohort being depressed at each wave. Surprisingly, a low level of bad PHS has been found in the cohort with less than 5% of the young adults having bad PHS at all waves. Completion of secondary and tertiary education and being employed have been found to significantly lower the odds of being depressed and increase the chances of having good PHS. Africans were significantly more likely to be depressed, as compared to other racial groups. Finally, being depressed was found to reduce the likelihood of good PHS.

Discussion: Education level completed and being employed have been found to significantly protect individuals from being depressed and to increase the likelihood of good PHS. In post-apartheid South Africa, the effects of inequalities arising from apartheid social and economic policies are still present with Africans being found more likely to be depressed.

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1 INTRODUCTION

1.1 Contextual Background

While many studies have been conducted on the effect of socio-demographic factors on perceived health status and depression, few studies have examined this relationship in a cohort over time. This study will look at the prevalence of depression and reports of bad perceived health status (PHS) among a cohort of young people through all the five waves of the South African National Income Dynamics Study (NIDS). NIDS was first conducted in 2007 and thereafter conducted biannually until 2017. This study will also examine the effect of socio-demographic factors (education level completed, employment status, relative household income, race, gender and age) on these two outcomes.

South Africa is a middle-income country, with poor health status, very high levels of socio-economic inequality and a history of apartheid. South Africa experiences what Mthembu and Eyal (2018) call a historically unique identity influenced by colonization and apartheid policies. Apartheid policies focused economic and health advances to white people in the first 80 years of the 20th century (Benatar, 2013). The apartheid era created social and economic inequalities among the different racialized groups that were created based on skin colour. There was marked racial stratification with Whites at the top, Africans at the bottom and Indians and Coloureds, in the middle (Williams, Gonzalez, Williams *et al.*, 2008). The adverse effects of colonialization and apartheid are more apparent for Africans and these negative socio-political and socio-economic effects including poverty, economic inequality, racial and gender discrimination are linked to higher levels of mental illness (Masenya, de Wet and Coetzee (2017) cited in Eyal, Burns and Geel (2018)). While efforts have been made to address social and economic inequalities from apartheid policies, these inequalities continue to have an impact on physical and mental well-being in post-apartheid South Africa (Mayosi and Benatar, 2014).

A cohort of young people aged 15-24 at wave one is followed through all five waves of NIDS until they are aged 24-33 at wave five. The cohort followed in this study incorporates different groups (adolescents, youth, young adults) as definitions for age ranges vary. For purposes of this study, the cohort shall be referred to as a cohort of young people.

1.2 Summary of background literature

Mental health, health status and socio-demographic status (Kirigia, Sambo, Nganda *et al.*) are important determinants of an individual's well-being (Ardington and Case (2010) . PHS is a subjective measure of psychological and physical well-being (American Thoracic Society, 2007; Jylhä, 2009), while depression is a common mental disorder that affects the body, mood, thoughts and actions and can lead to an interference with the ability to work, sleep, eat and socialize (American Psychiatric Association, 2019; The South African Depression and Anxiety Group, 2019). Both PHS and depression tend to be affected by socio-demographic and environmental factors. There are thought to be important interactions between these dimensions of well-being, with causal links running in both directions (Ardington and Case, 2010). The two pathways that link poverty and mental health are called social causation and social drift. Social causation hypothesizes that poverty causes mental ill health, whereas social drift hypothesizes the opposite with mental health causing poverty (Lund, De Silva, Plagerson *et al.* (2011) , cited in Stoop, Leibbrandt and Zizzamia (2018)).

Compared to other middle-income countries, South Africa has a high burden of disease. The health and well-being of most South Africans remains affected by infectious and non-communicable diseases, persisting social disparities, and inadequate human resources to provide care for a growing population with increasing numbers of refugees and economic migrants (Mayosi and Benatar, 2014). Poverty, unemployment and sexism (socio-economic inequity) are core drivers of ill health in the country (Mayosi, Lawn, van Niekerk *et al.*, 2012). Improvements in overall population health have been compromised by growing economic disparities, incompetence, corruption, and failure or delay in widely applying the benefits of many medical advances. Despite certain areas of progress in the country since the end of apartheid in 1994, disparities in wealth and health are among the widest in the world (Benatar, 2013). Attention must be re-directed to the vitally important social factors that influence health for most South Africans (Benatar, 2013).

1.3 Problem Statement and Justification

Several studies have been conducted that have shown the relationship between perceived health and socio-demographic determinants, social cohesion and psycho-social well-being. However, few of these studies have examined such relationships in a cohort of young people over time including the modifying effect that depression may have on PHS.

1.4 Aim and Objectives

1.4.1 Aim

The aim of this study is to explore depression and PHS, and their socio-demographic determinants, among a cohort of young people over a nine-year period, as well as to examine the potential modifying effect that depression has on PHS.

1.4.2 Objectives

1. To establish the prevalence of depression and bad PHS in the cohort of young people during the study period
2. To establish the chances of transitioning to being depressed and transitioning to reporting bad PHS among the cohort of young people during the study period
3. To establish the effects of education level completed, employment status, relative household income, race, gender and age on depression and PHS (separately)
4. To establish the modifying effect of depression on PHS, while taking into account the effect of education level completed, employment status, relative household income, race, gender and age.

1.5 Significance of the study

With increasing attention being given to mental health issues, particularly depression, within a population health context, this study will present much-needed evidence on the prevalence of depression at the population level among young people. Depression has recently been identified as one of the leading causes of disability in the world. Globally, it is estimated that over 300 million people are estimated to suffer from depression, equivalent to 4.4% of the world's population (World Health Organization, 2017). Depression ranked 5th on the top ten causes of years lived with disability in South Africa in 2010 and 2017 respectively (Institute for Health Metrics and Evaluation, 2019; Neethling I, Pillay-van Wyk V, Joubert J *et al.*, 2017).

The prevalence of bad PHS will be investigated in this study. PHS is a long-standing measure of well-being. Some authors have given evidence as to why this measure is relevant and appropriate and others have critiqued its usefulness. This study will contribute to the debate on the utility of PHS as a measure of well-being.

This study will contribute to the body of knowledge on the socio-demographic factors that matter for depressive symptoms and for PHS among a cohort of young people between 2008 and 2017 in South Africa. This study will also analyse the

relationship between depression and PHS because of the suspected association between how a person rates their health and whether they are depressed or not.

1.6 Dissertation Outline

This dissertation is made up of five chapters. This first chapter has given a background of the study, including the study aims and objectives. The second chapter is a review of literature on depression, PHS and the socio-demographic determinants of health. The third chapter presents the data source, data cleaning steps and the methods applied to analyse the data. The fourth chapter presents the findings of the analysis and the fifth chapter discusses the study findings in line with existing literature and provides a conclusion.

2 LITERATURE REVIEW

2.1 Introduction

Physical and mental health are important aspects of an individual's wellbeing with socio-demographic factors being important determinants of these. Mental and physical health are among the goals for achieving healthy adolescence (Resnick, Catalano, Sawyer *et al.*, 2012). There are thought to be important interactions between physical health, mental health and socio-demographic factors, with the correlates of reporting fair or poor health being similar to those of reporting depression (Ardington and Case, 2009). This chapter presents a review of literature on perceived health status, depression and the socio-demographic determinants of health.

2.2 Perceived Health Status (PHS) as a measure of wellbeing

Perceived health status (PHS) is defined as the subjective rating by an individual of his or her own psychological and biological well-being (American Thoracic Society, 2007; Jylhä, 2009; Miilunpalo, Vuori, Oja *et al.*, 1997). Perceived health status (PHS) is also referred to as self-rated health (SRH). For this study, the use of PHS will be maintained. PHS is a useful indicator of the overall health and well-being of individuals and populations (Fayers and Sprangers, 2002; Prus, 2011). PHS is usually measured by asking the question "How do you rate your health at present?" with responses on a Likert scale ranging from excellent to poor (Layes, Asada and Kephart, 2012).

PHS is conceptualised as consisting of two components: latent health status and reporting behaviours (Patrick and Erickson (1993) cited in Layes, Asada and Kephart (2012)). Latent health has been defined as the intrinsic value assigned to the duration of life as modified by impairments, functional stress, perceptions and social opportunities. These modifications are influenced by disease, injury, treatment or policy. Reporting behaviour has been defined as the systematic measurement error between PHS and latent health. Reporting behaviour is similar to a filter through which latent health passes when an individual is asked to rate his or her health (Layes, Asada and Kephart, 2012). The impact of health conditions on individuals' physical, social and emotional well-being cannot be separated from the context of how it affects their lives, and in this sense reporting behaviour can reflect differences in health (Jylhä, 2009).

Some researchers have suggested that care needs to be exercised when interpreting outcomes of PHS because of the diverse viewpoints of individuals when

they are asked to rate their own health. There are two differences in PHS, the first difference comes from biological variation (functional variation) and the second difference comes from the perception and reporting of experiences differently, reflecting the knowledge, evaluation and or social context of latent health (Layes, Asada and Kephart, 2012). PHS questions have been labelled by some researchers as poorly "framed" because they do not specify what is meant by overall health. As such individuals responses to the same question may change over time and do not have the same frame of reference (Fayers and Sprangers, 2002). The identification of conceptual domains assessed by the PHS measure was done by Krause and Jay (1994) . The authors suggested that although responses to the PHS question are determined primarily by current illness, health behaviour and physical functioning, the same frame of reference is not used by all respondents in answering this question. The authors also suggest that mental health problems appear to play a major role in shaping individual health perceptions globally (Krause and Jay, 1994).

With the aim to answer the question, "What does self-rated health measure?", an investigation into the determinants of PHS in men and women in British Whitehall II and French Gazel cohort studies was conducted. The study found that measures of mental and physical health status contribute most to the PHS construct and that psychosocial factors are important correlates of PHS. The authors concluded that, while PHS is a multidimensional simple measure, is in effect a valid measure of health (Singh-Manoux, Martikainen, Ferrie *et al.*, 2006).

PHS differs from most indicators of health because an inidividuals own account of their health is not guided by formal, agreed rules or definition. There are good reasons to believe that the answers to the PHS question sometimes are more intuitive and sometimes more consciously reflective (Jylhä, 2009). However, users of PHS measures must acknowledge and understand the determinants of PHS, including reporting behaviour. Individuals' reporting of their health is unique and influenced by knowledge about one's own health, social norms and expectations for illness, and adaptability to and acceptability of illness (Layes, Asada and Kephart, 2012).

2.3 Mental health, an important aspect of well-being

Depression is a prevalent and common psychological disorder that affects the body, mood, thoughts and actions and can lead to an interference with the interest or ability to work, sleep, eat and socialize (American Psychiatric Association, 2019; Roy and Campbell, 2013; The South African Depression and Anxiety Group, 2019). The

interference in an individual's everyday activities makes depression an important aspect of well-being and a potential modifier of perceived health because of its would-be interaction with infectious and chronic diseases (individuals with a chronic and/ or infectious disease are more likely to be depressed) (Mayosi, Lawn, van Niekerk *et al.*, 2012). Socio-demographic and psychosocial factors have a significant influence on the aetiology of depression and as such, population-level interventions that address the social determinants of well-being are required (Roy and Campbell, 2013).

Mental health, particularly depression, has in recent times gained attention as a public health concern. The World Health Organization (2001) estimated that, in 1990, mental and neurological disorders accounted for 10% of the total disability adjusted life years (DALYs) lost due to all diseases and injuries. This was 12% in 2000 and by 2020, it was projected that the burden of these disorders will have increased to 15%. Depression was ranked as the largest contributor to global disability (7.5% of all years lived with disability in 2015) (World Health Organization, 2017). In South Africa, depression ranked 5th on the top ten causes of years lived with disability in 2010 and 2017 respectively (Institute for Health Metrics and Evaluation, 2019; Neethling I, Pillay-van Wyk V, Joubert J *et al.*, 2017). About 14% of the global burden of disease has been attributed to neuropsychiatric disorders, mostly due to the chronically disabling nature of depression and other common mental disorders, alcohol-use and substance-use disorders, and psychoses. This burden of mental disorders is likely to have been underestimated because of inadequate appreciation of the connectedness between mental illness and other health conditions (Prince, Patel, Saxena *et al.*, 2007).

In adolescents, although often unrecognized, unipolar depressive disorder is said to be common worldwide, with the burden being highest in low-income and middle-income countries (Thapar, Collishaw, Pine *et al.*, 2012). Work on mental health in children, adolescents and young adults has revealed that girls and young women are more likely than boys and young men to experience major depressive symptoms (Mojtabai, Olfson and Han, 2016) and that these sex differences with females being more likely to be depressed emerge during adolescence (Hänninen and Aro, 1996). However, Thapar, Collishaw, Pine *et al.* (2012) suggest that while depression is more common in girls, it is of importance to recognize it in boys.

The prevalence of depression varies according to the context in which it is measured. Across 53 countries, the prevalence of depression was found to have ranged from 0.4% to 15.7% with different mean estimates being computed for low-income

countries (6%) and upper-middle-income countries (7.6%) (Rai, Zitko, Jones *et al.*, 2013). The prevalence of depression could be seen as increasing when actually it has always been high but unreported due to socio-cultural reasons. In Sweden, there had been an increase in prevalence of nervousness and anxiety since 1990, one possible explanation for this is that it had become more socially accepted to report nervousness or anxiety (Molarius, Berglund, Eriksson *et al.*, 2009).

There exist different estimates for prevalence of depression among children and adolescents. While reasons for this vary, the changes in classification of depression, use of different tools used in measuring depression (Thapar, Collishaw, Pine *et al.*, 2012) and the different types of mental disorders investigated among other reasons could be cited. This has contributed to failing to make strong conclusions on whether the true prevalence of depressive disorders in adolescents has changed over time (Thapar, Collishaw, Pine *et al.*, 2012). A systematic review and meta-analysis of the world-wide prevalence of mental disorders in children and adolescents aged between 6 and 18 years of age was conducted based on 42 studies from 27 countries. The meta-analysis revealed that the pooled prevalence of mental disorders was 13.4%, of anxiety disorders was 6.5%, of any depressive disorders was 2.6%, of attention-deficit hyperactivity disorder was 3.4% and of disruptive disorders was 5.7%. These prevalence estimates were found to not vary as a function of geographic location and year of data collection (Polanczyk, Salum, Sugaya *et al.*, 2015). In an examination of national trends in 12 month prevalence of major depressive episodes in adolescents (12-17 years old) and young adults (18-25 years old) from different socio-demographic backgrounds, it was found that there was an increase from 8.7% in 2005 to 11.3% in 2014 in adolescents and from 8.8% to 9.6% in young adults (Mojtabai, Olfson and Han, 2016). Other systematic reviews and meta-analysis conducted using 35 studies on the prevalence of depression among university students found a prevalence of 33% (Sarokhani, Delpisheh, Veisani *et al.*, 2013) and another conducted using 24 articles found that the reported prevalence ranged from 10% - 85% with a weighted mean prevalence of 30.6% (Ibrahim, Kelly, Adams *et al.*, 2013). Depression was found to be present in nearly one third of all students (Ibrahim, Kelly, Adams *et al.*, 2013). The authors stated that these results suggest that university students experience rates of depression that are substantially higher than those found in the general population.

Research has shown that there is an association between depression and PHS. Variables measuring mental health and functional health were found to be generally

strongly correlated with PHS (Eriksson, Undén and Elofsson, 2001; Molarius, Berglund, Eriksson *et al.*, 2009). Similarly, Mayosi, Lawn, van Niekerk *et al.* (2012) in their paper on health in South Africa stated that there was an interaction between non-communicable diseases (NCDs), mental illness, infectious diseases and chronic diseases.

2.4 Socio-demographic determinants of health

2.4.1 Overview

Socio-demographic factors have been identified by several authors to be relevant and significant influencers of health (World Health Organization, 2003). There exists extensive literature on the socio-demographic determinants of health globally. Regardless of the country context, similar socio-demographic determinants of health apply differing only in significance.

Several authors have suggested that social, cultural, economic and historical backgrounds play important roles in how individuals see their health and use resources within their environment that could improve their health (Bennett and Waterhouse, 2018; Jylhä, 2009; Krause and Jay, 1994; Singh-Manoux, Martikainen, Ferrie *et al.*, 2006). It has been shown that income, education and occupation-related inequalities cannot determine the individuals' state of health in objective terms, but the lack of these factors is likely to deteriorate individuals' physical and mental conditions (Alvarez-Galvez, Rodero-Cosano, Motrico *et al.*, 2013).

Social, demographic and economic inequalities have caused variance in PHS and depression outcomes in both developed and less developed countries. Existing literature also suggests that for both communicable and non-communicable diseases, socio-demographic determinants of health cannot be discussed without considering the disparities that exist (Marmot, 2005). It has been suggested that the lower individuals are in the social hierarchy, the more likely they are to experience illness (World Health Organization, 2003) and that poor mental health is closely related to many forms of inequality (Marmot, Atkinson, Bell *et al.*, 2012). Disparities exist in indicators such as income, social class, occupation and parental occupation, level of education, housing condition, neighbourhood quality, geographic region, gender and ethnicity. A study of the determinants of excellent/good perceived health among HIV positive individuals in South Africa led to the suggestion that it is important to emphasize that differences across socioeconomic status (Kirigia, Sambo, Nganda *et al.*) may affect how individuals evaluate their health (Mabaso, Zungu, Rehle *et al.*, 2018).

2.4.2 Commonly used socio-demographic determinants of health

There exists a wide range of socio-demographic variables that can be used as predictors of depression and PHS. It has been suggested that it should be feasible to account for a large part of between and within variation in self assessed well-being using demographic variables (Baird, Lucas and Donnellan, 2010). Particularly, education level, employment status and income levels have been widely investigated as predictors of health (Bobak, Pikhart, Rose *et al.*, 2000; Chola and Alaba, 2013; Marmot, Atkinson, Bell *et al.*, 2012; Prus, 2011). Other variables used to assess physical and mental well-being are age, gender, marital status, race, and nativity (Kennedy, Kawachi, Glass *et al.*, 1998; Singh-Manoux, Martikainen, Ferrie *et al.*, 2006).

While education level completed, employment status and household income individually affect PHS and depression, it should be acknowledged that there is a connection in these three socio-economic factors. Expectation would be that education influences occupation status and in turn occupation determines household income. All of these factors are all assumed to be necessary in preventing depression and reporting PHS. An examination of pathways between socio-economic determinants of health among middle-aged women and men employed in Helsinki revealed that education is typically acquired first over the life course and that education contributes to occupational class position and through this to income (Lahelma, Martikainen, Laaksonen *et al.*, 2004).

2.4.2.1 Education

Education has been identified by many to be the most significant predicting factor for depression and PHS especially among adults (Alvarez-Galvez, Rodero-Cosano, Motrico *et al.*, 2013; Bobak, Pikhart, Rose *et al.*, 2000; Layes, Asada and Kephart, 2012; Leskinen, Antikainen, Peltonen *et al.*, 2012; Rai, Zitko, Jones *et al.*, 2013). The financial situation of young adults is sometimes difficult to compare because most of them would not have been absorbed into the labour market thereby making educational differences an appropriate way to take into account social differences in this phase of life (Waldhauer, Kuntz, Mauz *et al.*, 2019).

Studies from various contexts have shown that education provides knowledge and skills that allow one to identify ill health and report it as such. In Finland, education was found to play an important role in the acquisition and interpretation of health information (Leskinen, Antikainen, Peltonen *et al.*, 2012). In another European context, Alvarez-Galvez, Rodero-Cosano, Motrico *et al.* (2013) found that individual economic

conditions are a basic factor contributing to a good state of health, but education could be even more relevant to preserving health. The findings from a study conducted using data from the 2005 Canadian Community Health Survey revealed that higher socio-economic status was associated with a pessimistic perception of health. This led the authors to suggest that the poor and poorly educated people are often uniformed of how sick they are (Layes, Asada and Kephart, 2012).

Attaining a high level of education is advantageous for socio-economic reasons. In modern societies, education has close ties with success on the labour market and with other opportunities (Waldhauer, Kuntz, Mauz *et al.*, 2019). It was found that participants in the German KiGGS cohort were less likely to report poor PHS if they had high intergenerational education or if they experienced social upward mobility (Waldhauer, Kuntz, Mauz *et al.*, 2019). As personal developmental needs change with increasing age, the protective effect of educational resources also might increase. However, if a high level of education is increasingly required during an individuals' life course, a risk is posed for people who do not meet this requirement (Waldhauer, Kuntz, Mauz *et al.*, 2019).

Studies suggest that, compared to those with no education, persons with secondary and tertiary education were more likely to report good health (Ardington and Case, 2010; Kennedy, Kawachi, Glass *et al.*, 1998). It was found that across 53 countries, individuals who had less than secondary education had higher chances of being depressed (Rai, Zitko, Jones *et al.*, 2013). This finding led the authors to suggest that education may help to protect against depression by contributing to cognitive skills, attitudes and values shaping health-related behaviours (Rai, Zitko, Jones *et al.*, 2013). Similarly, in a study on income distribution, socioeconomic status, and perceived health in the United States, individuals with no education or with less than a high school education reported fair or poor health more than university graduates (Kennedy, Kawachi, Glass *et al.*, 1998).

In South Africa, education was found to be positively related with health status and protective of both physical health and household economic status, all of which is protective of mental wellbeing (Ardington and Case, 2010; Chola and Alaba, 2013). It was found that both women and men report fewer depression symptoms when they have more years of education on average (Ardington and Case, 2010).

2.4.2.2 Employment

A review of the literature shows that there is mixed evidence on the relationship between employment and well-being. Some studies found that occupation status had no clear or significant relationship with PHS (Alvarez-Galvez, Rodero-Cosano, Motrico *et al.*, 2013; Layes, Asada and Kephart, 2012). Other studies found being unemployed as a predicting factor for depression and for poor physical well-being. It was found in South Africa that employed persons and those in the highest income quintile were more likely to report good health (Chola and Alaba, 2013). In England, it has been shown that financial problems as a consequence of unemployment result in lower living standards. This could reduce social integration, lower self-esteem and trigger distress, anxiety and depression. Further to this, the authors found that unemployment can impact on health behaviours and is associated with increased smoking, alcohol consumption and lower levels of physical exercise (Marmot, Atkinson, Bell *et al.*, 2012). Across 53 countries, economically inactive people showed higher odds of depression in all country groups (middle-lower income, middle-upper-income and high-income) with the exception of low-income countries (Rai, Zitko, Jones *et al.*, 2013).

2.4.2.3 Relative Household Income

Analysing the effect of relative household income on young people is a delicate exercise. In early adulthood many young people still have very diffuse income situations and are not always fully integrated into the labour market despite many having finished school (Waldhauer, Kuntz, Mauz *et al.*, 2019).

In the general population, the effect of income on depression and health is well established. The relationship between low income and poor health is well known and it operates in several ways. People on low incomes refrain from purchasing goods and services that maintain or improve health or are forced to purchase cheaper goods and services that may increase health risks. Being on a low income also prevents people from participating in a social life and can leave them feeling like they are less worthy or have a lower status in society than the better-off (Marmot, Atkinson, Bell *et al.*, 2012). While income and education are correlated, income is more likely to represent purchasing power of goods and services that could improve health and reduce depression occurrence (Leskinen, Antikainen, Peltonen *et al.*, 2012).

In South Africa, Chola and Alaba (2013) found a positive association between indicators of economic standing and PHS. They suggest that, people in poor living

conditions report the worst health outcomes, while those in the highest income quintile were more likely to report good health.

2.4.2.4 Age

Previous studies have highlighted the importance of considering the effect of age in predicting depression and physical well-being.

Some studies have shown that younger subjects reported poorer mental health than older subjects (Molarius, Berglund, Eriksson *et al.*, 2009) while other studies have shown that the risk of depression increases with age (Ardington and Case, 2010). It has been found that most symptoms of depression emerge at the start of adolescence, and that the most dramatic increase in depression was found to occur between young adulthood and middle adulthood (Ardington and Case (2010) ; Hankin, Abramson, Moffitt *et al.* (1998) cited in Mthembu and Eyal (2018)). Adolescence and young adulthood are significant life phases for personal and health development. The development process often opens up opportunities, but also potentially creates health risks (Bennett and Waterhouse, 2018; Waldhauer, Kuntz, Mauz *et al.*, 2019). Emphasis has been placed on the large toll that mental health problems take during adolescence, as well as the potential long-run health and developmental effects (Baird, De Hoop and Özler, 2013).

Some authors have found that the risk of reporting bad PHS reduces with increasing age (Ardington and Case, 2009; Leskinen, Antikainen, Peltonen *et al.*, 2012) while others have found that the risk of reporting bad PHS increases as age increases (Eriksson, Undén and Elofsson, 2001; Subramanian, Kim and Kawachi, 2002). The risk of reporting bad PHS is expected to reduce as age increases in a population. The reduction in the reports of bad PHS could possibly be attributed to an adaptation to deteriorating health with increasing age although the prevalence of symptoms and diseases increases (Cockerham, Sharp and Wilcox, 1983; Hunt, McEwen and McKenna, 1984; Hunt, McKenna, McEwen *et al.*, 1980; Leskinen, Antikainen, Peltonen *et al.*, 2012). It is probable that individual history of past health and expected or aspired future health may be potential determinants of PHS in the elderly (Cockerham, Sharp and Wilcox, 1983; Singh-Manoux, Martikainen, Ferrie *et al.*, 2006). The effect of age in predicting PHS seems to be affected by the age range studied. It has been shown that in a narrow age range, age may not show any effect. However, age would be an important factor in a population with a wider age range (Hunt, McKenna, McEwen *et al.*, 1980). What

remains unclear is if the relationship between age and PHS is linear or whether it varies at different times of life (Hunt, McEwen and McKenna, 1984).

2.4.2.5 Race

Racial classifications, like cultural or ethnic groups, tend to be tied to norms and values around depression and overall well-being (Baron-Epel, Kaplan, Haviv-Messika *et al.* (2005) cited in Layes, Asada and Kephart (2012)). Furthermore, outcomes of depression and PHS are also tied to discrimination and inequalities that arise as a result of racial segregation (World Health Organization, 2001).

The use of race as a determinant of health in South Africa needs to be done with caution. The case of South Africa is rather unique taking into consideration the effects of the apartheid regime. This unique experience of South Africa renders race as a determinant of social, health, and demographic inequality. Although race itself may not directly cause health or other social or demographic outcomes, racial classifications may implicitly or explicitly mediate decisions and/or opportunities over an individual's life course (Moultrie and Dorrington, 2012). Because of this, race is important for understanding social inequalities even in the post-apartheid times where all data on race are self-reported (Moultrie and Dorrington, 2012). The strongest reason for continuing to collect information on race (and therefore to conduct analyses using race as an indicator of social well-being) in South Africa is to monitor and track progress in redressing the iniquities of apartheid social and economic policies (Moultrie and Dorrington, 2012).

South African researchers have long described the multiple ways in which the deeply entrenched differential allocation of material and socio-political privileges based on race could have pervasive adverse consequences on the health of racially stigmatized groups. Historically racially stigmatized groups (Africans, Coloureds and Indians) generally report worse health than Whites (Ardington and Case, 2009; Stoop, Leibbrandt and Zizzamia, 2018; Williams, Gonzalez, Williams *et al.*, 2008).

2.4.2.6 Gender

Gender disparities exist in health, education and employment among other spheres of life, with women being disadvantaged in most cases. Women have been found more likely to rate their health as poorer than men and are more likely to be depressed.

It was found in 53 countries, that women were more likely than males to be depressed. This led to a suggestion that it may be possible that changes in traditional gender roles may actually lead to a narrowing between the rates of depression in women

and men (Rai, Zitko, Jones *et al.*, 2013). The authors stated that further research is required to clarify the reasons and mechanisms behind this finding (Rai, Zitko, Jones *et al.*, 2013). In Sweden, an association existed between how burdensome domestic work was experienced and anxiety/depression for both men and women. The authors supported the notion that a ground for good mental health includes balance in social relations, in domestic work and in employment, as well as in personal economy both among men and women (Molarius, Berglund, Eriksson *et al.*, 2009).

The results of a large cross-sectional survey in Goa, India also found strong associations between common mental disorders and indicators of disadvantage among women, including early age at marriage, intimate partner violence and abuse, and absence of decision-making autonomy (Prince, Patel, Saxena *et al.*, 2007).

The association between gender and PHS has been found to be small in some studies (Singh-Manoux, Martikainen, Ferrie *et al.*, 2006; Waldhauer, Kuntz, Mauz *et al.*, 2019) and pronounced in others (Kennedy, Kawachi, Glass *et al.*, 1998; Prus, 2011). Other studies have found no effect (Eriksson, Undén and Elofsson, 2001). Adolescent girls were found to report fair/poor PHS slightly more than the boys and this tendency continued among young women compared to young men (Waldhauer, Kuntz, Mauz *et al.*, 2019). In Stockholm, the distributions of PHS were essentially similar for men and women (Eriksson, Undén and Elofsson, 2001). Evidence from South Africa shows that women report a greater number of symptoms of depression than do South African men (Ardington and Case, 2009; Moultrie and Kleintjes, 2006). Females were also found more likely to report poor health than men (Chola and Alaba, 2013). The authors explain that this is likely to be a result of their relatively low standing in society, which restricts access to health care services (Chola and Alaba, 2013).

2.5 Gaps in literature

Several studies have been conducted on the effect of socio-demographic status on PHS (Alvarez-Galvez, Rodero-Cosano, Motrico *et al.*, 2013; Bobak, Pikhart, Rose *et al.*, 2000; Cramm and Nieboer, 2011; Phongsavan, Chey, Bauman *et al.*, 2006). However, few studies have examined this relationship over time particularly in low-income and middle-income contexts (Lund, De Silva, Plagerson *et al.*, 2011). This study follows an age cohort over a nine-year period in a middle-income country.

Studies that have been conducted on PHS and depression have focused mostly on the elderly and until recently, little has been known about middle age and younger age groups (Eriksson, Undén and Elofsson, 2001; Hunt, McEwen and McKenna, 1984;

Phongsavan, Chey, Bauman *et al.*, 2006; Subramanian, Kim and Kawachi, 2002). This study focuses particularly on a cohort of young adults thereby contributing to knowledge on PHS and depression prevalence and their socio-demographic correlates among this age group.

Few studies have investigated the effect of socio-demographic factors on depression in low income and middle income countries (Lund and Cois, 2018; Lund, De Silva, Plagerson *et al.*, 2011). Evidence for interactions between mental health and other health conditions comes overwhelmingly from the developed world (Prince, Patel, Saxena *et al.*, 2007). This study will also contribute to the body of knowledge on the relationships between depression and PHS as driven by socio-demographic factors in an African context among young adults.

The use of PHS as a measure of population health has received both positive and negative feedback. Some authors have labelled PHS as a useful measure of overall health and well-being (Fayers and Sprangers, 2002; Prus, 2011), while others have questioned its reliability (Krause and Jay, 1994; Layes, Asada and Kephart, 2012). This study will contribute to the discussion on the utility of PHS as a measure of population level well-being.

2.6 Theory of change

The theory of change created for this study is shown in Figure 2.1. The following assumptions have been made; i) that socio-demographic factors have an impact on depression, ii) that socio-demographic factors have an effect on PHS and iii) that depression has a modifying effect on PHS. This study acknowledges the bi-directional relationships that exist between socio-demographic factors and depression; between socio-demographic factors and PHS and between depression and PHS. However, national and international literature suggest that the most common pathway is socio-demographic factors having an effect on depression, socio-demographic factors having an effect on PHS and depression modifying PHS (Alvarez-Galvez, Rodero-Cosano, Motrico *et al.*, 2013; Ardington and Case, 2010). This is the conceptualisation that will be applied in this study. The arrows on the theory of change diagram shown in Figure 2.1 are a depiction of the different directions that relationships among variables could take. This study investigates only the relationships indicated with solid arrows.

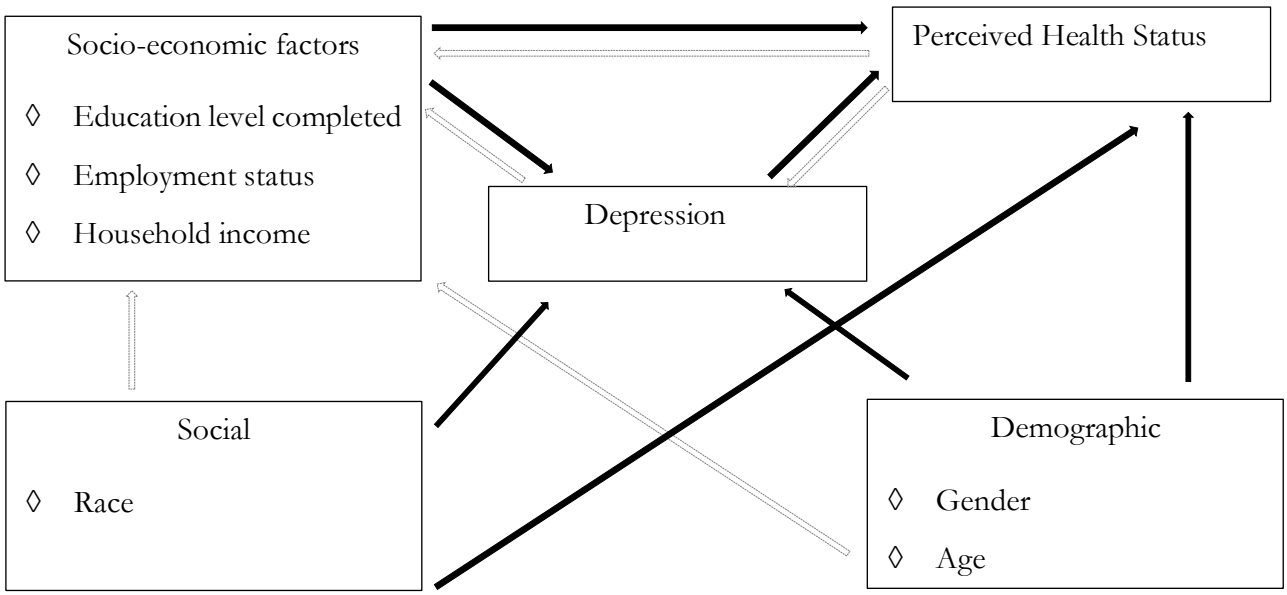
Mental and physical health are linked (Tomlinson, Grimsrud, Stein *et al.*, 2009). However, the linkage between mental and physical health has been largely ignored (Prince, Patel, Saxena *et al.*, 2007). This relationship is said to be bi-directional (Bhugra,

Kar and Lawton-Smith, 2014). Individuals suffering from mental illnesses are less likely to take care of their physical health (Eyal and Burns, 2016). While mental and physical disorders may be present simultaneously, depression very often predates these (Prince, Patel, Saxena *et al.* (2007) cited in Eyal and Burns (2016)).

Two pathways have been postulated for mental health. The social causation pathway where poverty causes mental ill health might apply more readily to common mental disorders such as depression. The social drift or social selection pathway is the opposite of the social causation. In the social drift pathway, mental health causes poverty. This might be more applicable to disorders such as schizophrenia and intellectual disabilities. The social causation and social drift pathways are complex with evidence suggesting that they move in both directions for most mental, neurological and substance abuse disorders (Hudson, 2005; Lund, Brooke-Sumner, Baingana *et al.*, 2018; Lund and Cois, 2018; Lund, De Silva, Plagerson *et al.*, 2011). Several longitudinal studies have supported various causal pathways involving social causation (Hudson, 2005) as will be done in this study. Lund and Cois (2018) conducted the first nationally representative longitudinal study investigating both social causation and social drift in a low-income and middle-income context.

It was found that socio-cultural influences on emotional expression result in differing population mean depression scores (Eaton, Smith, Ybarra *et al.* (2004) cited in Ardington and Case (2010)). In the case of South Africa, segregation may affect depression scores and PHS between the different racialized groups. Furthermore, it was found that inequality on income and expenditure appears to be extended into inequality in domains such as mental health and that gender gaps in depression scores tend to be narrower at higher levels of SES (Ardington and Case, 2010).

Figure 2.1: Theory of Change



3 DATA AND METHODS

This chapter gives a description of the data source, datasets and the methods that are applied to analyse the data. The chapter also describes the steps taken to organize the data, lists the outcome and predictor variables and describes the regression models.

3.1 Defining young people

The cohort followed consists of different age groups (adolescents, youth, young adults). Adolescents are all persons aged between 10 and 19 (UNICEF, 2019). The United Nations defines all persons between the ages of 15 and 24 years as youth. This definition varies from country to country, depending on the specific socio-cultural, institutional, economic and political factors (United Nations Department of Economic and Social Affairs). In South Africa, all persons between the ages 14 and 35 are referred to as youth (South African Government. Presidents Office, 1996). The United Nations further distinguishes teenagers from young adults. Teenagers are aged 13-19 and young adults are aged 20-24 (United Nations Department of Economic and Social Affairs). For the purposes of this study, the cohort followed will be referred to as the cohort of young people.

This cohort has been selected because studies have revealed that during these ages, significant transitions occur. These transitions include the completion of education, entry into the labour force and family formation (Bennett and Waterhouse, 2018; Sarokhani, Delpisheh, Veisani *et al.*, 2013). These transitions often present opportunities but could potentially also pose a threat to the well-being of young people. Challenges encountered are a cause for concern and they have implications for both short and long-term health (Bennett and Waterhouse, 2018).

3.2 Data Source

The data are taken from the National Income Dynamics Study (NIDS) waves one to five (Southern Africa Labour and Development Research Unit, 2008, 2010-2011, 2012, 2014-2015 2017). NIDS is the first face-to-face national household panel study in South Africa which examined the livelihoods of individuals and households over time. NIDS began in 2008 with a nationally representative sample of over 28,000 individuals in 7,300 households across the country and was conducted biannually until 2017. The themes of NIDS cover poverty and well-being; household composition and structure; fertility and mortality; migration; labour market participation and economic activity; human capital

formation, health and education; vulnerability and social capital (Brophy, Branson, Daniels *et al.*, 2018).

Each individual in NIDS was allocated a unique person identifier (Metrics). Surveys were repeated on the same household members, called continuing sample members (CSMs). Children born to CSM mothers were added to the sample of CSMs and were tracked. When any other individuals became part of the household, they were referred to as temporary sample members (TSMs) and were consequently interviewed but not tracked in the following waves. Further to this, if CSMs left a household of a TSM, the TSMs were not followed (Brophy, Branson, Daniels *et al.*, 2018).

To track movers from a household and also to minimise non-contact, NIDS used the Computer Assisted Personal Interviewing (CAPI) software to record addresses and contact details for movers. CAPI also has a search that allowed interviewers to search on town or local area to identify the mover location from province down to main place level, thereby providing additional information to contact details and addresses (Brophy, Branson, Daniels *et al.*, 2018).

Overall, 73% of the individuals interviewed in wave one were successfully interviewed in wave five; 77% of the 1, 856 CSMs who were either added to the study in wave two or not successfully interviewed in wave one were successfully interviewed in wave five; 87% of CSMs who were added in wave three were successfully interviewed in wave five and 92% of the CSMs who were added in wave four were successfully interviewed in wave five (Brophy, Branson, Daniels *et al.*, 2018).

As with most panel studies, the problem of attrition that is inherent to longitudinal studies was experienced in the NIDS data as a result of refusal, no contact and death. A low response rate was observed in the baseline sample at wave one and subsequent high attrition in waves two to four of Whites and Indian/Asian and high-income respondents. This then led to the addition of a top-up sample at wave five to maintain representativeness of the sample (Brophy, Branson, Daniels *et al.*, 2018).

3.3 Description of Data Sets

In this analysis, the data from all five waves of the NIDS are merged and appended into one working data set. For each wave, the individual derived file, household derived file and the adult data set are merged and then appended to the equivalent files from other waves.

The NIDS household-derived files provide post-stratification weights and design weights and the individual-derived files provide panel weights. Where applicable, this

study applies post-stratification weights. The post-stratification weights calibrate the sample to the corresponding population total. Each of the waves was treated as a cross-section of the South African population and separately calibrated to the given mid-year population estimates released in 2015 (waves one to four) and 2017 (wave five) by Statistics South Africa. In other words, the post-stratification weights make the sample interviewed at a particular wave representative of the South African population in the corresponding year. The design weights correct for non-response and the panel weights account for attrition (Brophy, Branson, Daniels *et al.*, 2018; Leibbrandt and Woolard, 2016).

The panel being obtained and used is an unbalanced panel. An unbalanced panel is a dataset where not all units are observed across all periods or waves (Biørn, 2016). The advantage of using an unbalanced panel is that it allows the use of a much larger number of observations, thereby increasing efficiency (Longhi and Nandi, 2014).

3.4 Description of Sample

The total sample size for this study is 26, 866 observations. The sample consists of a cohort of young people born between 1984 and 1993, that is those aged 15-24 years in wave one and followed through all the waves of NIDS until they are aged 24-33 at wave five. The post stratification weights which calibrate the sample to the corresponding population are applied.

Table 3.1 shows the sample size and the represented South African population in millions by wave, year of survey and age group at time of survey. It is shown that there were 4, 524 young people aged 15-24 in wave one, representing 7.78 million South Africans of the same age in 2008; by wave five there were 5, 796 young people aged 24-33 representing 9.38 million South Africans of the same age in 2017.

Table 3.1 Sample size and corresponding South African Population in millions by wave, year of survey and age group

Wave	Year	Age Group	NIDS sample size	Population represented (millions)
1	2008	15-24	4524	7.78
2	2010/ 2011	17-27	5357	8.76
3	2012	19-28	5171	8.30
4	2014 / 2015	21-31	6018	9.38
5	2017	24-33	5796	9.38
		Total observations	26866	

Source: Derived from NIDS Waves 1-5

3.5 Variables

3.5.1 Outcome Variables

3.5.1.1 Depression

NIDS used the 10-item Centre for Epidemiological Studies Depression Scale (CES-D-10) to measure depression. The CES-D-10 scale is a short self-report scale designed to screen for depressive symptomatology in the general population (rather than for clinical diagnosis) (Radloff, 1977). The CES-D-10 scale is made up of three items on depressed affect, five on somatic symptoms and two on positive affect (Baron, Davies and Lund, 2017). The questions asked whether, in the past week, behaviours and feelings related to depression occurred: rarely or none of the time (less than 1 day); some or little of the time (1-2 days); occasionally or a moderate amount of time (3-4 days); or all of the time (5-7 days). For the negative questions, the scores range from zero for the response rarely or none of the time to three for the response all of the time, while for the positive questions, the scores are reversed such that rarely or none of the time scores three and all of the time scores zero.

To arrive at the depression variable, the questions from the emotional health section of the NIDS questionnaires for all five waves are recoded so that the responses are equated to the score on the CES-D-10 scale. The total scores for each individual across all 10 questions are summed to give a total. This total is used as the depression score variable. The scores of the CES-D-10 scale range from 0 to 30. Depression is only computed for individuals that answered all 10 questions. In line with other studies using NIDS data to assess depression (Baron, Davies and Lund, 2017), individuals

scoring 10 or less are grouped as not depressed and those scoring more than 10 as depressed.

3.5.1.2 PHS

To measure PHS, NIDS asked the question "How would you describe your health at present? Would you say it is excellent, very good, good, fair or poor?". These responses were coded from one to five, with one indicating excellent and five indicating poor health (Southern Africa Labour and Development Research Unit, 2008, 2010-2011, 2012, 2014-2015 2017).

A binary version of PHS which is used in the analysis, is generated by grouping excellent, very good and good into one category called good PHS and fair and poor into another category called bad PHS.

3.5.2 Predictor Variables

3.5.2.1 Age

This study follows a cohort of young people starting with the age group 15-24 at wave one until they are aged 24-33 at wave five. Age is treated as a continuous variable. The age variable is obtained by subtracting the year of birth from the year of interview. The odds obtained from the regression models are reported for each year increase in age.

3.5.2.2 Gender

In this study, gender is treated as a discrete binary variable with categories male and female.

3.5.2.3 Race

In this study, race is treated as a discrete variable with four self-reported categories African, Coloured, Indian/Asian and White. The respondents were asked what population group they would describe themselves as belonging to. Moultrie and Dorrington (2012) stated that the repeal of the Population Registration Act in 1991 removed the legal basis for classifying the population by racial or ethnic group. Since 1994, race has been entirely self-reported and not subject to state reinterpretation in South Africa. Choices are offered to people on how to classify themselves, since the state continues to use the four-category-classification system.

In the regression models, the Coloured, Asian/Indians and Whites are compared to Africans, as they are the most populous racial group.

3.5.2.4 Education level completed

In this study, a variable for education level completed is generated from two variables on education: highest school grade completed and whether an individual had completed some form of tertiary education. The first category of the education level completed variable consists of individuals who had completed neither secondary nor tertiary education, the second category consists of individuals who had completed secondary education and the third category consists of individuals who had completed some form of tertiary education. In the regression models, individuals who have completed secondary education and completed some form of tertiary education are compared to those who completed neither secondary nor tertiary education.

3.5.2.5 Employment Status

NIDS derived a variable for employment status which is found in the individual derived file. NIDS categorizes this employment variable into not economically active, unemployed discouraged, unemployed strict and employed. Not economically active persons are those persons aged 15-64 years who are neither employed nor unemployed in the reference week (Statistics South Africa, 2018). In this study, the two categories of unemployed are grouped together such that they follow what Statistics South Africa terms as the expanded definition of unemployment. According to the expanded definition, unemployed persons are those individuals aged 15-64 years who a) were not employed in the reference week; and b) actively looked for work or tried to start a business in the four weeks preceding the survey interview; and c) were available for work (i.e. would have been able to start work or a business in the reference week); or d) had not actively looked for work in the past four weeks but had a job or business to start at a definite date in the future and were e) available to work but i) are discouraged work seekers ii) or have other reasons for not searching (Statistics South Africa, 2018). In the regression models, unemployed and employed individuals are compared to not economically active individuals.

3.5.2.6 Self-reported household income classification

The self-reported household income classification variable is found in the adult dataset. NIDS asked each adult respondent how they would classify their household in terms of income, compared with other households in their village/suburb. The response categories are much above average income; above average income; average income; below average income and much below average income. I make use of this self-reported

measure of household income because an individual's economic productivity depends on their relative consumption or income or status within their peer group (Baird, De Hoop and Özler, 2013). In addition to this, the graded nature of the relationship between income and health is consistent with the fact that a person's relative position on hierarchy is important for health. This relative position influences decisions on purchasing goods or services that maintain or improve health and decisions on participating in social activities that can leave one feeling less worthy than those they see as better off (Marmot, Atkinson, Bell *et al.*, 2012).

In the regression models, individuals who classify themselves as being in above average income households, average income households, below average income households and much below average income households are compared to those who classify themselves as being in much above average income households.

3.6 Methods

3.6.1 Summary of variables

Using the *xtsum* command in STATA, a summary of outcome and predictor variables is obtained. The summary statistics which show the overall mean of all observations; the overall, between and within standard deviation; the minimum and maximum observations; the number of individuals (n); total number of individual-time observations (N) and the average number of time points (T bar) are a first step in examining the data. Particularly, the summary of variables is obtained so as to have an overview of the change happening in individuals and overtime. The between-variation is an indication of the change from one person to another and the within-variation is the change in an individual across time.

3.6.2 Descriptive analysis

For purposes of descriptive analysis, the sample is weighted with the post-stratification weights provided in the household derived files of the NIDS data sets. Both predictor and outcome variables are described using figures and tables. The description of the outcome variables gives the percentage of the cohort who are classified as depressed and also gives the percentage of the cohort reporting bad PHS.

3.6.3 Transition Probabilities

Transitions from each state (categories of variable) to the next can be calculated once the observations have been organized in time order (t) within each wave (i). In STATA, the *xttrans* command can be used to obtain transitions from one state to another over

time (Frain, 2019). It should be noted that *xttrans* does not normalise for missing values and all transition probabilities that will be presented here are calculated without imputation for missing values. Transitions obtained as frequencies and percentages are converted into probabilities, which show the chances of transitioning from one category to another. Higher chances of transition are an indication of expected high prevalence in depression and PHS and vice versa.

3.6.4 Mixed Effects Regression Analysis

The methods appropriate (generalized mixed effects regression) for unbalanced panels are applied in this analysis. Mixed Effects Regression models provide information regarding relationships between covariates and repeated responses by capturing correlations of repeated measures using random effects that serve to describe cluster-specific trends over time (Garcia and Marder, 2017). In this study, the random effect (grouping variable) used is the person identification. According to Hedeker and Gibbons (2006) , generalized mixed effects regression models are appropriate for unbalanced panels of data and are quite robust to missing data and irregularly spaced measurements. This modelling approach is used in this analysis because of the said robustness to irregularly spaced measurements and missing data thereby increasing the number of observations that are used in the analysis.

Three regression models are created to establish the effects of the socio-demographic predictors on the outcomes. In all models, the predictor variables are education level completed, employment status, household income, race, gender and age. The outcome variable in model one is depression. In models two and three, the outcome variable is PHS. In model three, depression is added to the predictor variables so as to test if depression has a modifying effect on PHS.

4 RESULTS

This chapter presents the findings of the study. A summary of variables showing between and within variation is presented, followed by a description of both outcome and predictor variables, transition probabilities and lastly regression analysis to investigate the association between outcome and predictor variables.

4.1 Summary of variables

Summary statistics for time varying variables are shown on Table 4.1. The overall variation is the change over time and individuals, between-variation is the change from one person to another and the within-variation is the change in an individual across time. Between-variation is time-invariant whereas within-variation is time variant. Overall, there appears to be almost equal between and within variation in both outcome and predictor variables. The predictor variables all show slightly more between than within variation, although the difference is very small.

As can be seen from Table 4.1 the outcome variable, PHS binary, shows almost equal within variation and between variation. The overall variation is 0.19, the variation between individuals is 0.15 and the variation in an individual through all the waves is 0.14. The second outcome variable, depression, shows slightly higher variation in an individual across time than between individuals. The overall variation is 0.38, between variation is 0.28 and within variation is 0.30.

Table 4.1 also shows that the predictor variables have higher variation between individuals than within the same individual through all the waves of NIDS, although the difference in the variation for classification of relative household income is very small. For education level completed, the overall variation is 0.76, variation between individuals is 0.69 and within an individual across all the waves of NIDS is 0.39. For employment status, the overall variation is 1.31, between individuals, the variation is 1.05 and variation within an individual through all the waves of NIDS is 0.92. For relative household income classification, the overall variation is 0.97, variation between individuals is 0.75 and variation within an individual through the waves of NIDS is 0.73.

Table 4.1 Summary of variables for the cohort of young people

Variable		Mean	Std. Dev.	Observations
PHS	overall	0.96	0.19	N = 26827
	between		0.15	n = 9722
	within		0.14	T bar = 2.76
Depression	overall	0.17	0.38	N = 26258
	between		0.28	n = 9653
	within		0.30	T bar = 2.72
Education level completed	overall	0.56	0.76	N = 26830
	between		0.69	n = 9725
	within		0.39	T bar = 2.76
Employment Status	overall	1.23	1.31	N = 26742
	between		1.05	n = 9717
	within		0.92	T bar = 2.75
Relative Household income class	overall	3.50	0.97	N = 25686
	between		0.75	n = 9583
	within		0.73	T bar = 2.68

Source: Derived from NIDS Waves 1-5

4.2 Description of Variables

The figures and tables below present a description of both outcome and predictor variables.

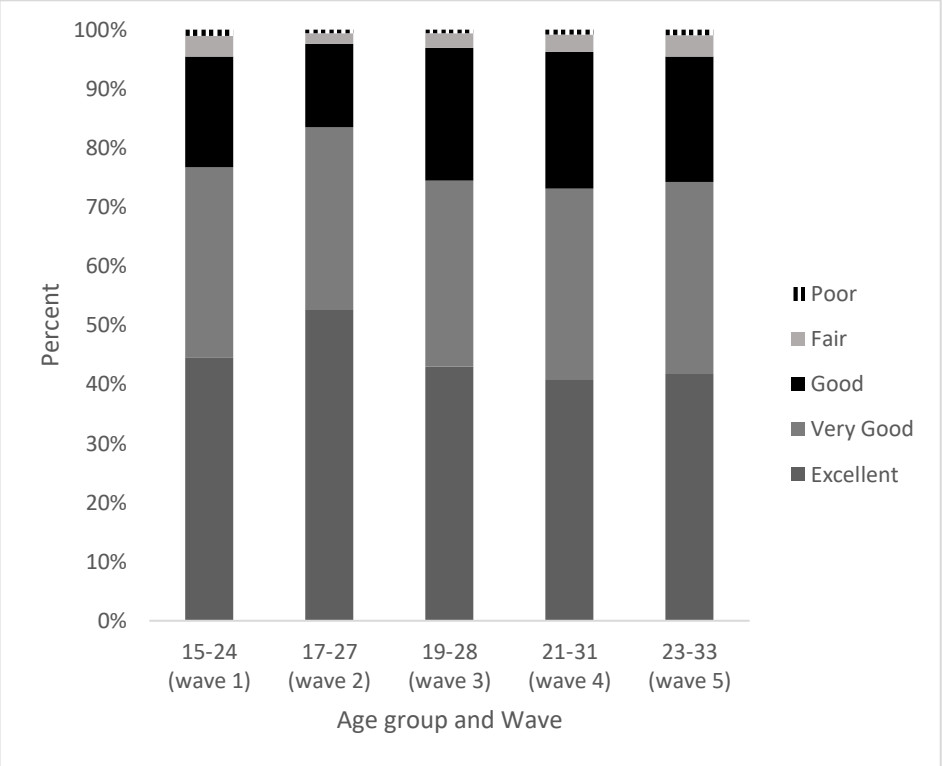
4.2.1 Perceived Health Status (PHS)

Figure 4.1 shows the distribution of respondents by PHS, wave of NIDS and age group of the cohort. It is shown that through all the five waves of NIDS, the cohort of young people overwhelmingly reported that that their health was good, very good or excellent. Generally, the change in PHS at population level through all the five waves is small with the most notable changes happening in the excellent and good categories between age group 17-27 (wave 2) and age group 19-28 (wave 3).

An increase in the percentage of people reporting excellent health is seen when the cohort is aged 17-27 (wave 2) where 52.6% report excellent health compared to 44.6% when the cohort is aged 15-24 (wave 1). At least 30% of the cohort report very good health at each wave through all the five waves of NIDS. A corresponding decline

in the cohort of young people reporting good health is seen between age groups 15-24 and age group 17-27, moving from 18.7% in age group 15-24 to 14.1% in age group 17-27. At least 20% of the cohort report good health at each wave in the proceeding age groups. Only a small percentage of the cohort of young people report fair and poor health, both categories show a slight decrease in age group 17-27 which is followed by slight increases in the proceeding waves. The highest percentages of fair and poor health combined are 4.6% when the cohort is aged 15-24 and 4.5% when the cohort is aged 23-33 respectively (wave 5).

Figure 4.1 Percent distribution of PHS among the South African Population (cohort aged 15-24) by age group and wave



Source: Derived from the NIDS waves 1-5

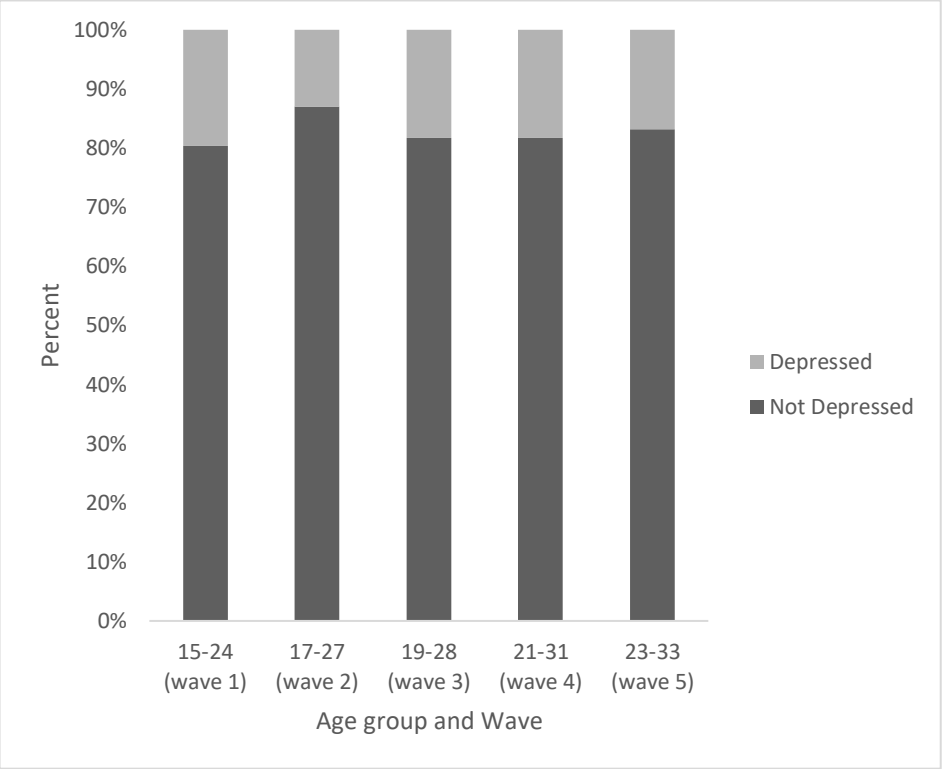
A binary version of PHS is generated by grouping the categories excellent, very good and good into one category called good PHS and grouping the categories fair and poor into another category called bad PHS. Overall, less than 5% of the cohort of young people report bad health through all five waves of NIDS. In age group 15-24 (wave 1), 4.6% of the cohort report bad PHS, this is followed by a decline to 2.4% in age group 17-27 (wave 2). Thereafter, small increases in the percentage of the cohort of young people reporting bad PHS are seen with 3.1% reporting bad PHS in age group

19-28 (wave 3), 3.8% at in age group 21-31 (wave 4) and 4.5% in age group 23-33 (wave 4) (figure not shown).

4.2.2 Depression

Figure 4.2 shows that through all the five waves of NIDS, 13-20% of the cohort of young people aged between 15 and 33 were classified as depressed. In the age group 15-24 (wave 1), 19.6% of the cohort of young people were classified as depressed, this was followed by 12.9% in age group 17-27 (wave 2), 18.3% in age group 19-28 and 21-31 (waves 3 and 4) and 16.8% in age group 23-33 (wave 5).

Figure 4.2 Percent distribution of depression among the South African population (cohort aged 15-24) by age group and wave



Source: Derived from the NIDS waves 1-5

4.2.3 Education level completed

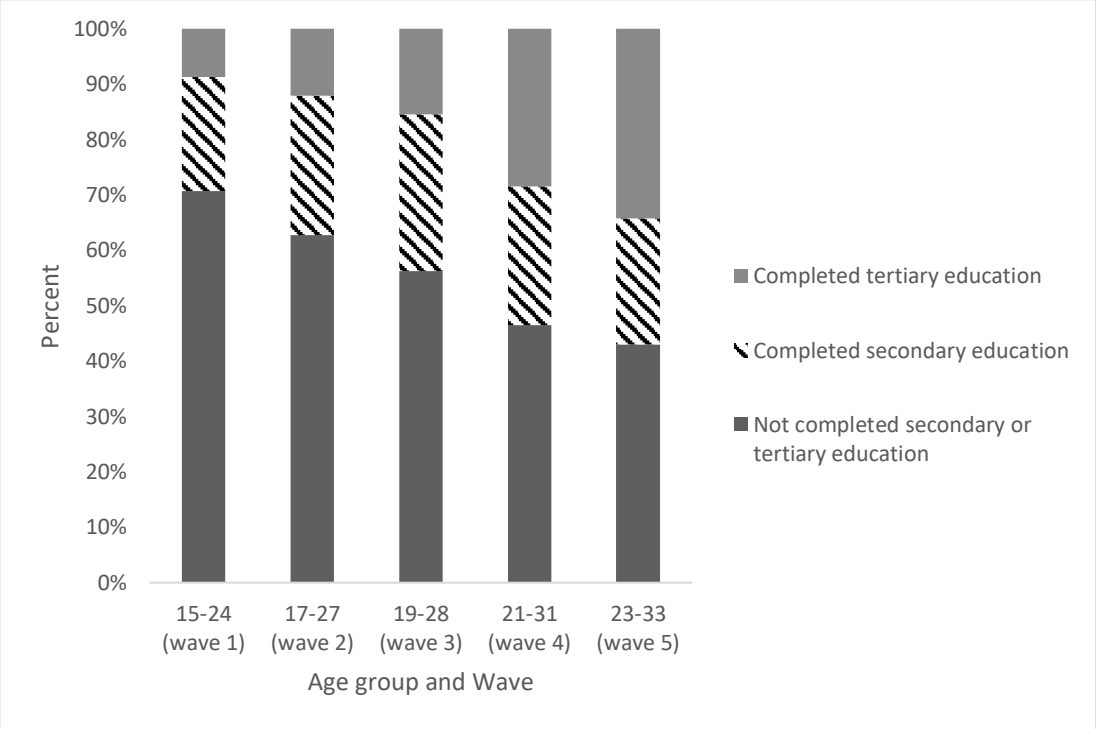
Figure 4.3 shows the percentage distribution of education level completed by age group and wave. Through all the five waves, majority of the cohort had not completed secondary or tertiary education. However, a steady increase can be seen in the proportions who completed secondary education and tertiary education as age increases with each proceeding wave.

In the age group 15-24 (wave 1), 70.7% of the cohort of young people had not completed secondary or tertiary education, this is followed by a continued decline in proceeding waves reaching a low of 55.2% in the age group 23-33 (wave 5).

In the age group 15-24 (wave 1), 20.6% of the cohort of young people had completed secondary education, this is followed by an increase at age groups 17-27 (wave 2) and 19-28 (wave 3) where 25.2% and 28.29% of the cohort had completed secondary education. A decline is seen age groups 21-31 and 23-33 (waves 4 and 5) where 25.1% and 22.7% of the cohort had completed secondary education respectively.

Steady increases are seen in the percentage of the cohort of young people who had completed tertiary education. In the age group 15-24 (wave 1), 8.7% of the cohort had completed tertiary education, this increased with increasing age and was highest in age group 23-33 (wave 5) where 34.3% of the cohort of young people had completed tertiary education. It should be noted that the changes in percentages achieving both secondary and tertiary level education happen in line with the increases in age of the cohort.

Figure 4.3 Percent distribution of education level completed among the South African Population (cohort aged 15-24) by age group and wave



Source: Derived from the NIDS waves 1-5

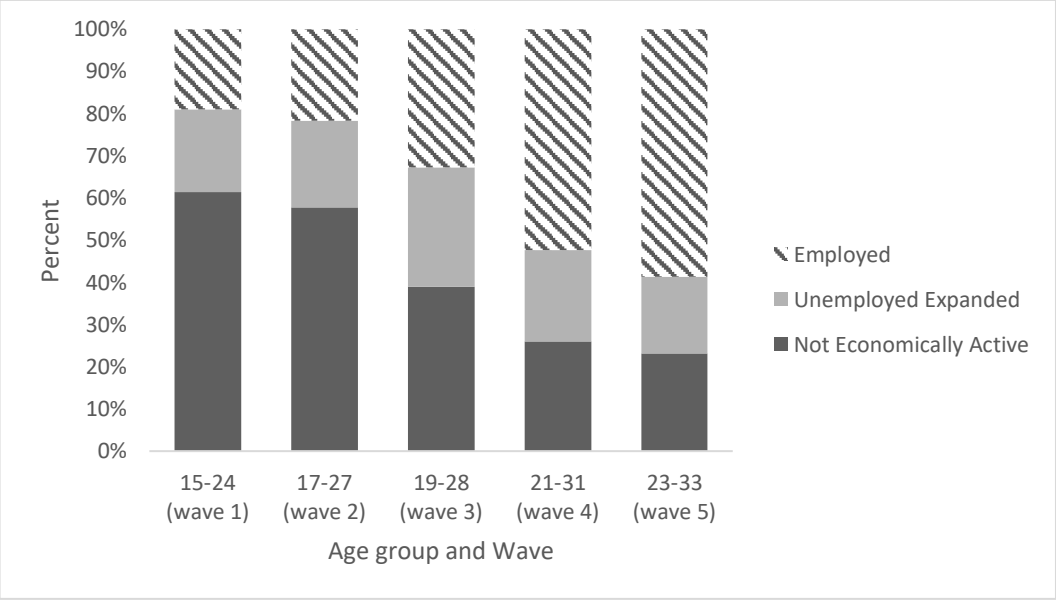
4.2.4 Employment Status

The percentage distribution of employment status by age group and wave is shown in Figure 4.4 below. This study makes use of the expanded definition of unemployment[1].

Generally, the percentage of the cohort of young people who are not economically active decreases as age increases, the percentage of the cohort who are unemployed stays almost the same through all five waves increasing only at wave three and the percentage of the employed young people increases with each wave as age increases.

It can be seen in Figure 4.4 that in age group 15-24 (wave 1), 61.4% of the cohort of young people were not economically active. By age group 23-33 (wave 5), this had reduced to 23.1%. In age group 15-24 (wave 1), 19.6% of the cohort of young people were unemployed dropping to 18.2% by age group 23-33 (wave 5). Unemployment was highest at age group 19-28 (wave 3), where 28.3% of the cohort of young people were unemployed. It is also shown in Figure 4.4 that the percentage of the cohort employed increases from 19.1% in age group 15-24 (wave 1) to 58.7% in age group 23-33 (wave 5).

Figure 4.4 Percent distribution of employment status among the South African population (cohort aged 15-24) by age group and wave



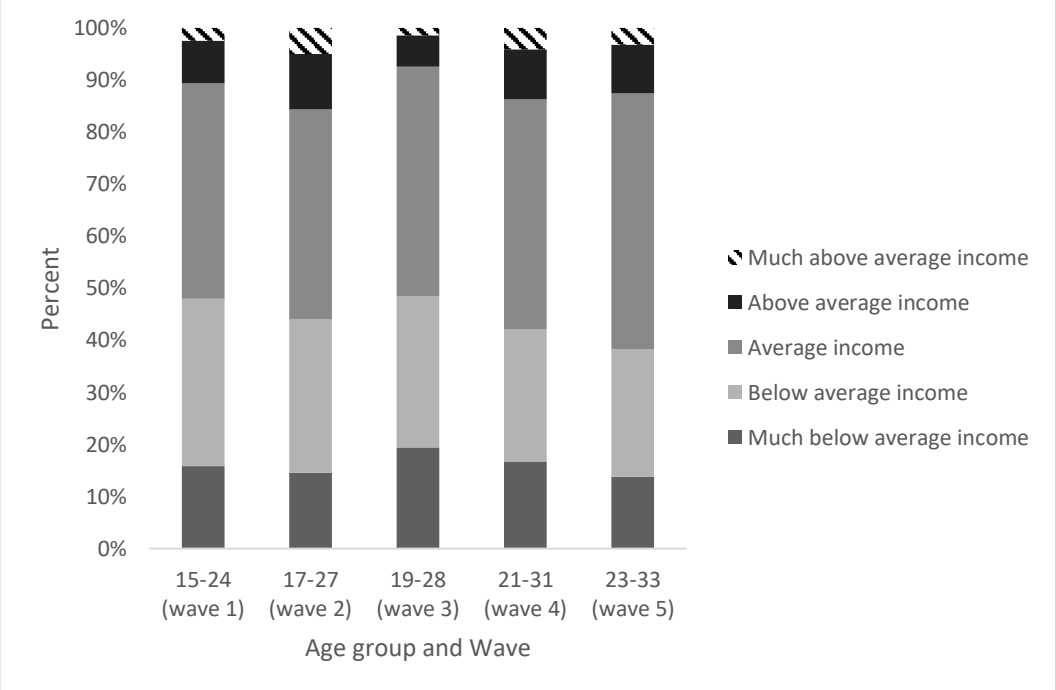
Source: Derived from the NIDS waves 1-5

[1] Unemployed persons according to the expanded definition are those individuals aged 15-64 years who a) were not employed in the reference week; and b) actively looked for work or tried to start a business in the four weeks preceding the survey interview; and c) were available for work (i.e. would have been able to start work or a business in the reference week); or d) had not actively looked for work in the past four weeks but had a job or business to start at a definite date in the future and were e) available to work but i) are discouraged work seekers ii) or have other reasons for not searching

4.2.5 Relative (Self-reported) Household Income Classification

Relative household income has been categorized into five categories by NIDS as shown in Figure 4.5 below. Generally, through all the five waves, 41%-49% of the households are classified as having average income. The smallest percentage of individuals classify themselves as being in much above average income households, moving from 2.5% in age group 15-24 (wave 1) to 3.0% in age group 23-33 (wave 5). Through all the five waves, 8.2% to 10.6% of individuals classify themselves as being in above average income households. The percentage of individuals classifying themselves as being in average income households increases from 41.4% in age group 15-24 (wave 1) to 49.2% in age group 23-33 (wave 5), whereas that of individuals classifying themselves as being in below average income households reduces from 32.2% in age group 15-24 (wave 1) to 24.4% in age group 23-33 (wave 5). Through all the five waves, the percentage of individuals classifying themselves as being in much below average income households ranges between 13.8% and 19.5%.

Figure 4.5 Percent distribution of relative household income classification of the South African population (cohort aged 15-24) by age group and wave



Source: Derived from the NIDS waves 1-5

4.2.6 Age

The cohort of young people aged 15-24 at wave one was followed through all the five waves of NIDS until they are aged 24-33 at wave five. The sample comprised 17.8% of

15-24 year olds at wave one, 20.1% of 17-26 year olds at wave two, 19.1% of 19-28 year olds at wave three and 21.5% of 21-30 and 24-33 year olds at waves four and five respectively (figure not shown).

4.2.7 Race

Table 4.2 below shows the percent distribution of the represented South African population cohort by race and wave. It can be seen that through all five waves, at least 80% of the cohort of young people identified themselves as African, 6%-7% as Coloured, 2% as Asian/Indian and 4%-5% as White. These distributions stayed almost consistent through all five waves.

Table 4.2 Percent distribution of the South African population (cohort aged 15-24) by wave and race

Wave	Race				Total
	African	Coloured	Asian/ Indian	White	
1	87.31	6.06	1.68	4.95	100.00
2	86.32	6.99	1.62	5.06	100.00
3	86.41	7.59	1.64	4.36	100.00
4	85.12	7.59	1.87	5.42	100.00
5	87.04	7.25	1.65	4.07	100.00

Source: Derived from the NIDS waves 1-5

4.2.8 Gender

There were more (51%-53%) females than males through all the five waves of NIDS (figure not shown).

4.3 Transition Probabilities

Chances of transitioning from each state (category of variable) to the next can be calculated once the observations have been organized in time order - *t*, within each wave - *i*. The transition probabilities of both outcome and predictor variables through all the five waves of NIDS are presented below.

4.3.1 PHS

Table 4.3 shows the transition probabilities for the binary version of PHS. These probabilities have been calculated from 26, 827 observations. The chances of transitioning from bad PHS to good PHS are higher (0.88) than transitioning from good PHS to bad PHS (0.03). It can also be seen in Table 4.3 that there is 0.12 chance of

reporting bad PHS at each wave (through all the five waves) and 0.97 chance of reporting good PHS at each wave.

Table 4.3 Transition probabilities for PHS

PHS	Bad	Good	Total
Bad	0.12	0.88	1.00
Good	0.03	0.97	1.00

Source: Derived from the NIDS waves 1-5

4.3.2 Depression

The transition probabilities for depression are shown in Table 4.4. These probabilities have been calculated from 26, 258 observations. Chances of transitioning from depressed to not depressed are higher (0.82) than transitioning from not depressed to depressed (0.16). It can also be seen from Table 4.4 that there is a 0.84 chance of individuals being classified as not depressed at each wave and 0.18 chance of being classified as depressed at each wave throughout the five waves.

Table 4.4 Transition probabilities for depression

Depression	Not Depressed	Depressed	Total
Not Depressed	0.84	0.16	1.00
Depressed	0.82	0.18	1.00

Source: Derived from the NIDS waves 1-5

4.3.3 Education level completed

The transition probabilities for education level completed have been presented in Table 4.5. These probabilities have been calculated from 26, 830 observations. There is a 0.84 chance of staying in the not completed secondary or tertiary education state, 0.70 chance of staying in the completed secondary education state and 0.78 chance of staying in the completed tertiary education state through all the five waves. The probability of transitioning from not completed secondary or tertiary education to completed secondary education is 0.10 and of transitioning to completed tertiary education is 0.06. The probability of transitioning from completed secondary education to completed tertiary education is 0.24. While probabilities have been given of transitioning from completed secondary education and from completed tertiary education to not completed secondary or tertiary education, it should be noted that this transition will not

occur as one cannot transition back to non-completion after completing and hence this result should be ignored.

Table 4.5 Transition probabilities for education level completed

Education Level Completed	Not completed secondary or tertiary education	Completed secondary education	Completed tertiary education	Total
Not completed secondary or tertiary education	0.84	0.10	0.06	1.00
Completed secondary education	0.06	0.70	0.24	1.00
Completed tertiary education	0.08	0.13	0.78	1.00

Source: Derived from the NIDS waves 1-5

4.3.4 Employment Status

The transition probabilities for employment status are shown on Table 4.6. These probabilities have been calculated form 26, 742 observations. At each wave through all the five waves, the chance of being not economically active is 0.51, the chance of being unemployed is 0.30 and the chance of being employed is 0.68. The most likely transition is from being unemployed to being employed and the least likely transition is from being employed to not being employed.

It can be seen from Table 4.6 that at each wave through all the five waves, the chance of transitioning from not economically active to unemployed is higher (0.25) than that of transitioning from not economically active to employed (0.24). At each wave through all five waves, the chance of transitioning from unemployed to not economically active is 0.33 and that of transitioning from unemployed to employed is 0.37. Further, at each wave through all five waves, the chance of transitioning from employed to not economically active is higher (0.17) than that of transitioning from employed to unemployed (0.16).

Table 4.6 Transition probabilities for employment status

Employment Status	Not Economically Active	Unemployed Expanded	Employed	Total
Not Economically Active	0.51	0.25	0.24	1.00
Unemployed Expanded	0.33	0.30	0.37	1.00
Employed	0.17	0.16	0.68	1.00

Source: Derived from the NIDS waves 1-5

4.3.5 Relative Household income

The transition probabilities for relative household income classification are shown in Table 4.7. The most likely transitions are from all other income classes into above average income and the least likely transitions are from all other income classes into much above average income. The chances are higher for transitioning to average income, below average income and much below average income from other income classes at each wave through all five waves.

Table 4.7 shows that through all five waves, there is a 0.05 chance of individuals classifying themselves as being in a household with much above average income, 0.11 chance of individuals classifying themselves as being in a household with above average income, 0.48 chance of individuals classifying themselves as being in a household with average income, 0.31 chance of individuals classifying themselves as being in a household with below average income and 0.23 chance of individuals classifying themselves as being in a household with much below average income.

Table 4.7 Transition probabilities of relative household income classification

Household Income Classification	MAAI	AAI	AI	BAI	MBAI	Total
MAAI	0.05	0.10	0.39	0.28	0.19	1.00
AAI	0.02	0.11	0.48	0.26	0.12	1.00
AI	0.04	0.09	0.48	0.26	0.14	1.00
BAI	0.03	0.07	0.39	0.31	0.20	1.00
MBAI	0.04	0.07	0.36	0.30	0.23	1.00

Source: Derived from the NIDS waves 1-5

Note: MAAI - Much above average income, AAI - Above average income, AI - Average income, BAI - Below average income MBAI - Much below average income

4.4 Regression Analysis

Three regression models have been run and are presented in the proceeding sections. The two outcomes will be investigated separately first, and then jointly because of the suspected association between how a person rates their health and whether they are depressed or not. Across all models, the predictor variables used are age, gender, race, education level completed, employment status and relative household income. In model one, the outcome variable is depression, in models two and three, the outcome variable is PHS. Model three includes depression as a predictor variable. An attempt was made

to include interaction terms between age and education level completed and age and employment status because of the expected change in education level completed and employment status as age increases. However, some observations were not used, and others omitted because of collinearity. Other interaction terms that were included are the interactions between race and education level completed; race and employment status; race and household income; sex and education; sex and employment status; sex and household income and employment and education status. These interactions were included because of the possibility of differentials in socio-economic status by race and sex. All of these interactions were not statistically significant. The regression outputs presented show the number of observations used in the model including the groups created from these observations, odds ratio (OR), p-value and the 95% confidence intervals for each coefficient.

4.4.1 Model 1: Mixed Effect Logistic Regression for depression

A mixed effects regression model has been run for the outcome depression with a total of 25, 230 observations grouped into 9, 536 groups using person identification as the grouping variable/random effect. The regression output is presented in Table 4.8 below.

Overall, increasing age had a minimal effect on depression in this cohort, the odds of being depressed are higher for females, for Africans, for individuals who had not completed secondary or tertiary education, for those who are not economically active and those who classify themselves as being in households having relatively much above average income.

There is a 1% increase in the odds of being depressed as age increases between age 15 to 33 in this cohort and a 10% increase in the odds of depression in females compared to males. There is a 34% lower chance of depression among coloureds, 41% lower chance of depression among Asian/ Indians and 46% lower chance of depression among Whites all in comparison to Africans. The corresponding p-values and confidence intervals are statistically significant.

The odds of depression reduce by 9% for individuals who completed secondary education and by 17% for individuals who completed tertiary education compared to individuals who had not completed secondary or tertiary education. The corresponding p-values and confidence intervals are statistically significant.

There is a 12% lower likelihood of depression among unemployed individuals and 10% lower likelihood among employed individuals compared to individuals who are

not economically active. The corresponding p-values and confidence intervals are statistically significant.

In comparison to individuals who classify themselves as being in households having much above average income, the odds of depression are 12% lower for individuals who classify themselves as being in households having above average income; 50% lower for those who classify themselves as being in households having average income; 36% lower for those who classify themselves as being in households having below average income and 12% lower for those who classify themselves as being in households having much below average income. The p-values (0.22 and 0.18) for odds of depression for those in above average income and much below average income are higher than the predefined limit of 0.05 and hence render these odds statistically insignificant. Further to this, the accompanying confidence intervals for both categories contain a zero and this too renders these odds statistically insignificant. All other corresponding p-values and confidence intervals are statistically significant. There is no trend in the odds as the relative household income class rank reduces.

Table 4.8 Model 1: Mixed Effect Logistic Regression for depression

Mixed-effects logistic regression (Number of obs = 25,230)
Number of groups = 9,536
Group variable: personal identification number (pid)

Depression	Odds Ratio	P>z	95% Confidence Interval	
Age	1.01	0.00	1.01	1.02
Sex				
Female	1.10	0.01	1.03	1.18
Male (Ref)				
Race				
Coloured	0.66	0.00	0.59	0.75
Asian/ Indian	0.59	0.01	0.39	0.90
White	0.54	0.00	0.38	0.78
Black (Ref)				
Education level completed				
Completed secondary education	0.91	0.02	0.83	0.99
Completed some form of tertiary education	0.83	0.00	0.75	0.91
Not completed secondary/ tertiary education (Ref)				
Employment Status				
Unemployed Expanded	0.88	0.01	0.80	0.96
Employed	0.90	0.02	0.82	0.98
Not economically active (Ref)				
Household Income Classification				
Above average income	0.88	0.22	0.73	1.07
Average income	0.50	0.00	0.42	0.59
Below average income	0.64	0.00	0.54	0.76
Much below average income	0.88	0.18	0.74	1.06
Much above average income (Ref)				

Source: Derived from the NIDS waves 1-5

4.4.2 Model 2: Mixed Effects Logistic Regression for PHS

A mixed effects logistic regression model has been run for perceived health status. The model has been run on a total of 25, 537 observations which were grouped into 9, 568 groups using the random intercept/grouping variable PID.

Overall, Table 4.9 shows that the odds of reporting good PHS reduce with increasing age, are lower for females and for individuals who completed neither secondary nor tertiary education.

There is a 7% lower chance of reporting good PHS with increasing age in this cohort and a 28% lower chance of reporting good PHS among females compared to males of the same age group. The corresponding p-values and confidence intervals show statistical significance.

The chances of reporting good PHS increase by 17% for Coloureds, 1% for Asian/ Indians and reduce by 2% for Whites than for Africans. All of these odds ratios are not statistically significant as the corresponding p-values are all greater than 0.05 and all the confidence intervals contain 0.

The odds of reporting good PHS increase by 45% for individuals who completed secondary education and by 56% for individuals who had completed tertiary education compared to those who had not completed secondary or tertiary education. These odds are statistically significant.

The odds of reporting good PHS increase by 20% for individuals who are unemployed and by 44% for individuals who are employed compared to individuals who are not economically active. The odds for those who are employed are statistically significant whereas the odds for those who are unemployed are not found to be statistically significant.

Compared to the households classified as having much above average income, the odds of reporting good perceived health among all other categories show no statistical significance. The odds of reporting good PHS are 16% lower for individuals in above average income households, 35% lower for individuals in average income households, 35% lower for individuals in below average income households and 39% lower for individuals in much below average income households. Although all the odds for income classification are not found to be statistically significant, a declining trend in the odds is shown as the categories reduce in ranking. This suggests that individuals classifying themselves as having much above average income are more likely to report having good PHS.

Table 4.9 Model 2: Mixed Effects Logistic Regression for PHS

Mixed-effects logistic regression (Number of obs = 25,537)
Number of groups = 9,568
Group variable: personal identification number (pid)

PHS	Odds Ratio	P>z	95% Confidence Interval	
Age	0.93	0.00	0.92	0.95
Sex				
Female	0.72	0.00	0.61	0.85
Male (Ref)				
Race				
Coloured	1.17	0.23	0.90	1.52
Asian/ Indian	1.01	0.98	0.46	2.21
White	0.98	0.96	0.50	1.93
Black (Ref)				
Education level completed				
Completed secondary education	1.45	0.00	1.19	1.77
Completed some form of tertiary education	1.56	0.00	1.24	1.96
Not completed secondary/ tertiary education (Ref)				
Employment Status				
Unemployed Expanded	1.20	0.05	1.00	1.45
Employed	1.44	0.00	1.19	1.75
Not economically active (Ref)				
Household Income Classification				
Above average income	0.84	0.55	0.49	1.46
Average income	0.65	0.08	0.40	1.05
Below average income	0.65	0.08	0.40	1.05
Much below average income	0.61	0.05	0.37	1.00
Much above average income (Ref)				

Source: Derived from the NIDS waves 1-5

4.4.3 Model 3: Mixed Effects Logistic Regression for PHS including Depression as a predictor variable

A mixed effects logistic regression model for PHS binary was run as in model 2 with the addition of depression as a predictor variable. Depression has been included in the model following the hypothesised association between how a person rates their health and whether they are depressed or not. The model was run with 25, 212 observations grouped into 9, 533 groups using PID as the random intercept. The regression output of model 3 is shown in Table 4.10.

The odds of reporting good PHS are 51% lower for individuals who are depressed compared to individuals who are not depressed, and this result is statistically significant.

Similar to model 2, the odds of reporting good PHS reduce with increasing age, are lower for females and for individuals who completed neither secondary nor tertiary education.

It should be noted that the addition of depression to model 2 slightly changes the odds ratios of the predictor variables but the statistical significance does not change. There is an increase in some of the odds ratios for race, but these are not statistically significant. There is a reduction in the odds ratios for education level completed and this is statistically significant. There is a reduction in odds for the categories of relative household income. The odds for individuals who classify themselves as being in households with above average income are still not statistically significant while the odds of reporting good PHS for individuals who classify themselves as having average income, below average income and much below average income are statistically significant.

Table 4.10 Model 3: Mixed Effects Logistic Regression for PHS including Depression as a predictor variable

Mixed-effects logistic regression (Number of obs = 25,212)
Number of groups = 9,533
Group variable: personal identification number (pid)

PHS	Odds Ratio	P>z	95% Confidence Interval	
Age	0.93	0.00	0.92	0.95
Gender				
Female	0.73	0.00	0.62	0.86
Male (Ref)				
Race				
Coloured	1.10	0.46	0.85	1.42
Asian/ Indian	0.93	0.86	0.43	2.02
White	0.91	0.77	0.46	1.77
Black (Ref)				
Education level completed				
Completed secondary education	1.43	0.00	1.17	1.73
Completed some form of tertiary education	1.50	0.00	1.19	1.89
Not completed secondary/ tertiary education (Ref)				
Employment Status				
Unemployed Expanded	1.18	0.08	0.98	1.43
Employed	1.45	0.00	1.20	1.75
Not economically active (Ref)				
Household Income Classification				
Above average income	0.75	0.31	0.42	1.32
Average income	0.55	0.02	0.33	0.91
Below average income	0.56	0.03	0.34	0.93
Much below average income	0.55	0.02	0.33	0.92
Much above average income (Ref)				
Depression				
Depressed	0.49	0.00	0.41	0.57
Not Depressed (Ref)				

Source: Derived from the NIDS waves 1-5

5 DISCUSSION AND CONCLUSION

5.1 Discussion

This study set out to explore depression and PHS and their socio-demographic determinants among a cohort of young people. A summary of the variables was obtained to gain insight into individual and population level change in predictor and outcome variables. Transition probabilities were obtained to show the chances of transitioning from one category of a variable to another. Descriptive statistics were generated which showed prevalence of depression and prevalence of bad PHS. Finally, mixed effects regression models were run to assess the effect of socio-demographic factors on depression and PHS.

The results obtained showed that PHS varied slightly more between individuals than within an individual over time. Depression on the other hand varied slightly more within an individual over time than between individuals. The chances are higher for transitioning from bad PHS to good PHS and for transitioning from being depressed to not being depressed. The results also showed that less than 5% of the cohort of young people had reported having bad PHS and that 13%-20% of the cohort were depressed. Furthermore, the results confirmed that socio-demographic factors have an effect on depression and on PHS. Across all regression models, individuals who have completed secondary or tertiary education and those who were employed had lower chances of being depressed and higher chances of having good PHS. The White population have lower odds for depression and the Coloured population have higher odds of having good PHS. Being depressed was found to reduce the chance of reporting having good PHS.

5.1.1 Prevalence of depression

The prevalence of depression in this cohort of young people ranges from 13% to 20% through all the five waves of NIDS. The prevalence of depression was found to be 19.6% in age group 15-24; 12.9% in age group 17-27; 18.3% in age groups 19-28 and 21-31 and 16.8% in age group 23-33. Globally, mental and behavioural disorders are present at any point in time in about 10% of the adult population (World Health Organization, 2001). In adolescents (12-17 year olds) and young adults (18-25 year olds), the prevalence of depression was found to be 11.3% and 9.6% respectively (Mojtabai, Olfson and Han, 2016). A meta-analysis of the world-wide prevalence of mental

disorders in children and adolescents (aged 6 -18) revealed a pooled prevalence of 13.4% for mental disorders and 2.6% for depressive symptoms (Polanczyk, Salum, Sugaya *et al.*, 2015). The prevalence of depression observed in this cohort is high when compared to the global prevalence and to other studies that have looked at the prevalence of depression among adolescents. Depression is a public health concern and a high prevalence among young people has adverse consequences for their well-being and for the society. Not only does depression contribute largely to DALYs (World Health Organization, 2001), it also leads to risky behaviours, suicide and other physical health problems as depressed individuals are not able to care for themselves (The South African Depression and Anxiety Group, 2019).

5.1.2 Prevalence of bad PHS

The results showed that through all the five waves of NIDS, less than 5% of the cohort of young people reported having bad health. A report examining the perceived health status of various sectors of the South African population in 1999 showed that 12% of the South African Population had reported poor PHS (Statistics South Africa, 2004). The discrepancy in results obtained is not surprising considering that this study focuses only on a smaller age range of the population who would be expected to be healthier while the report by Statistics South Africa (2004) looked at the entire population. Taking into consideration that South Africa has a high burden of disease, observing a small percentage of bad PHS in this study is unexpected. One would question if these low levels of bad PHS are a true reflection of actual health outcomes.

5.1.3 Changes in Depression and PHS

Depression showed slightly higher within than between variation, suggesting that more change in depression states occurs in an individual than at population level. The chances of transitioning from being depressed to not depressed were higher than those of transitioning from not depressed to depressed. Although the chance of transitioning to being depressed was low, the chance of staying depressed through all waves of NIDS was slightly higher.

PHS showed almost equal between and within variation, suggesting that within an individual and at population level, the changes in PHS are almost equal. The similarity in variation of PHS is unexpected considering that at population level, the predictors of PHS varied more between individuals than within the same individual. The chances of transitioning from bad PHS to good PHS were higher than those of transitioning from

good PHS to bad PHS suggesting that young people in this cohort are more likely to move towards having good PHS.

5.1.4 Effects of socio-demographic factors on depression and PHS

The effects of socio-demographic factors on depression and PHS were investigated using mixed effects regression analysis. This was done in three models. In model one the outcome variable was depression. In models two and three, the outcome variable was PHS. The predictor variables used were education level completed, employment status, relative household income, age, gender and race. In model three, depression was included as a predictor variable.

5.1.4.1 Education

Individuals who completed secondary and completed tertiary education were found more likely to have good PHS and less likely to be depressed than those who did not. These results were statistically significant.

Generally, having higher education is associated with better health outcomes as has been found in the results of this study. However, this finding could also be a result of differential reporting behaviours: the higher the level of education attained, the more one gains knowledge around the value attached to well-being, including the ability to distinguish good health from bad health. Sen (2002) and Layes, Asada and Kephart (2012) suggested that people with less education may not be aware of how ill they really are, but that is no indication that there is little illness to perceive. Completion of secondary and tertiary education improves chances of reporting good PHS because of the ability that individuals get to acquire, evaluate and use health information (Mirowsky, 2017; Sen, 2002).

The odds of depression were found to be smaller for individuals who have completed secondary and tertiary education than for those who have not. This finding is similar to other studies (Layes, Asada and Kephart, 2012; Leskinen, Antikainen, Peltonen *et al.*, 2012; Rai, Zitko, Jones *et al.*, 2013). Arguably, completion of secondary education can be looked at as an achievement as it not only qualifies one for tertiary education but also creates and increases opportunities for individuals in the labour market. Currently, emphasis has increased around issues related to achieving and not achieving developmental tasks such as completion of an education level (Schulenberg, Sameroff and Cicchetti, 2004). Completion of secondary or tertiary education, if looked at as developmental tasks and as key elements of individual identity and self-fulfilment may lead to depression if not achieved. Education in itself does not prevent depression,

it is the social status, opportunities and self-fulfilment that arise from it that could prevent one from being depressed. Education forms a unique dimension of social status, with qualities that make it especially important to health. It influences health in ways that are varied, present at all stages of adult life, cumulative, self-amplifying, and uniformly positive (Mirowsky, 2017).

5.1.4.2 Employment

The statistically significant results showed that employed individuals were more likely to report having good PHS and less likely to be depressed than the non-economically active individuals. These findings are similar to those from the study by Rai, Zitko, Jones *et al.* (2013) who found that economically inactive people showed higher odds of depression in all country groups except low-income countries. These results are also similar to those from Statistics South Africa (2004) who found the not economically active individuals more likely to have poor PHS compared to the employed and the unemployed.

Employed individuals would be expected to generally have better health outcomes as has been found in this study where employed individuals were more likely to have good PHS. Speculatively, economic inactivity and unemployment could be as a result of poor health. In such a case, the economically inactive and unemployed individuals would be expected to have lower chances of having good PHS.

Employed individuals would be expected to have lower chances of being depressed as has been found in this study. While work environments and some occupations can be stressful, it would be expected that being unemployed and economically inactive may lead one to be depressed. Surprisingly, employed and unemployed individuals in this study had almost equal lower odds of not being depressed compared to the not economically active

5.1.4.3 Race

Africans have been found more likely to be depressed than Coloureds, Asians/Indians and Whites. This result was statistically significant. In apartheid times, Africans, Coloureds and Indians experienced systematic discrimination compared to Whites with Africans suffering the most injustices (Williams, Gonzalez, Williams *et al.*, 2008). Injustices included unfair access to education, health and areas of living (Moultrie and Dorrington, 2012). While the apartheid legislation was changed in 1994 (Moultrie and Dorrington, 2012; Williams, Gonzalez, Williams *et al.*, 2008), these results suggest that young people continue to be affected by structural racism. This is consistent with the

World Health Organization (2001) which stated that psychological, sociological and anthropological research has shown racism to be related to the perpetuation of mental problems.

Although the odds of reporting good PHS among the different races were found to not be statistically significant, the odds ratios suggested that Coloureds and Indian/Asians were more likely and Whites less likely to have good PHS compared to Africans. Other studies in South Africa have found Whites more likely to have better health on average than Coloureds, and Coloureds better health than Blacks (Case and Wilson, 2000; Statistics South Africa, 2004). The results of this study where Africans have lower chances of having good PHS could be an indication that the effects of the apartheid segregation on health are still at play. Being foreign born or non-white was found much more strongly associated with poor health in the US than in Canada. It was suggested that this could be a reflection of a multitude of interrelated structural or systemic factors including differences in histories of institutionalized racism, discrimination, and segregation (Prus, 2011). The findings of Prus (2011) may help us to understand these results from South Africa, which has a history of apartheid.

5.1.4.4 Gender

Females have been found to have statistically significant lower chances of reporting having good PHS and higher changes of being depressed compared to males.

A result of patriarchal inheritance from African traditions birthed the idea that 'proper' African women should not speak (Ebila, 2015). In a patriarchal South African society, the position of black women in traditional African societies and White women in settler societies was inferior (Motlafi, 2015; South african History Online, 2011). Because of being silenced and being treated as inferiors, females' pain is often underrated and side-lined. This could lower their chances to report good PHS. It is possible that women could actually have better health than men. Women have better health seeking behaviours and experience lower mortality compared to men (Bor, Rosen, Chimbindi *et al.*, 2015; Timaeus, 1999). There are extensive differences in the perception, expression, and tolerance of pain. This is because of a variety of psychological and social influences, with lifespan socialization having a role to play in how males and females perceive and express their pain (Miller and Newton, 2006). The findings of this study suggest that cultural norms and values may be placing women at a disadvantage in terms of expressing their actual well-being. A sense of humiliation, entrapment and lack of control over life are evoked by the depressive effects of

subordination and lower social ranking of women. This could be one of the reasons why this study has found women to have lower chances of reporting good PHS compared to men (World Health Organization Mental Health Determinants and Populations Team (2000) cited in Moultrie and Kleintjes (2006)).

Across different socioeconomic levels, the multiple social roles that women fulfil put them at greater risk of experiencing mental and behavioural disorders than males in the community (World Health Organization, 2001). South Africa is no exception to this, gender-based discrimination and violence against women are very high. Gender disadvantage, poverty, gender violence, HIV and peripartum depression were investigated as the main factors impacting women's mental health in South Africa (Moultrie and Kleintjes, 2006). Women continue to bear the burden of the responsibility associated with being wives, mothers, educators and carers of others, while they are increasingly becoming an essential part of the labour force (World Health Organization, 2001). An association was found between experiencing burdensome domestic work and anxiety/depression for both men and women (Molarius, Berglund, Eriksson *et al.*, 2009). This could in part explain why young women in South Africa are more likely to be depressed. Depression in many women is a predictable response to severe events and difficulties in their environment and with those with whom they have 'core ties' (World Health Organization Mental Health Determinants and Populations Team (2000) cited in Moultrie and Kleintjes (2006)).

5.1.4.5 Age

The statistically significant results showed that the odds of having good PHS are lower with each year increase in age, but that age had almost no effect on depression in this cohort.

It has been suggested that young people often tend to use health behaviours to assess their PHS, whereas those who are older are more inclined to think in terms of health problems (Krause and Jay, 1994). The chances of reporting good PHS are expected to decrease with increasing age as a result of age-related ailments among other reasons as has been found in this study where the odds of reporting good PHS decrease with every year increase in age.

Every year increase in age in this cohort had almost no effect (odds ratio = 1.01) on depression and this result was statistically significant. This result is different to the findings of other authors (Ardington and Case, 2009; Ardington and Case, 2010; Leskinen, Antikainen, Peltonen *et al.*, 2012) who found depression to be more prevalent

in older ages and the risk of depression to increase with increasing age. This study shows only a 1% increase in the likelihood of depression with increasing age in the study cohort. One of the reasons for this is the difference in age cohorts used in this study compared to other studies. This study looks at a smaller age range of a cohort of young people while the other studies look at a broader age range which includes young and older adults.

5.1.4.6 Relative Household income

Relative (self-assessed) household income has been found to not be statistically significant in predicting good PHS. However, after the inclusion of depression as a predictor of bad PHS, some of the odds ratios become statistically significant. It has been observed that the chances of reporting good PHS decrease as the income class reduces.

The role of income in predicting depression is unclear in this study. The pattern of odds does not show any trend as the income class reduces. The odds of depression are lowest for individuals who classify themselves as being in households with above average income and much below average income but are found to not be statistically significant. Rai, Zitko, Jones *et al.* (2013) stated that evidence to support an association between income inequality and mental disorders, such as depression, is weak and inconsistent.

5.1.5 The association between depression and PHS

The inclusion of depression as a predictor of good PHS showed that individuals who are depressed are statistically significantly less likely to report having good PHS compared to those who are not depressed. This result suggests that depression has a negative association with having good PHS and confirms that depression has a modifying effect on PHS. Depression symptoms affect everyday activities and it would be expected that this in itself would induce bad health. In another study in South Africa, mental health was found to correlate strongly with physical health, with an increase on the depression index causing an increase in negative PHS (Case and Wilson, 2000).

5.1.6 Using the CES-D-10 Scale to measure depression

The CES-D-10 scale was used to measure depression in this study. It is a good scale to assess depression because the 10 questions it consists of ask about depressive symptoms which have been validated in longer scales (Radloff, 1977). The comparability of the results from this study to those from other studies needs to be done with caution since

no standard cut off point for classifying individuals as depressed or not exists. This study used a cut off score of 10 as has been done in previous studies using NIDS data (Baron, Davies and Lund, 2017). Using a lower cut off score would increase the prevalence of depression, while using a higher cut off score would reduce the prevalence of depression. I recommend the creation of a standard cut off score for all users of this scale to follow when classifying individuals as depressed or not depressed.

5.1.7 Using PHS as a measure of well-being at population level

Subjective measures of health such as PHS may be affected by differences in "thresholds" used by individuals or groups in assessing their health status (Prus, 2011). The difference in thresholds used by individuals to assess PHS gives rise to the question: is PHS a good measure of well-being? Further, the effects of socio-demographic factors and depression on the reporting of PHS seen in this study lead me to question if PHS is a good measure of population level well-being.

A stability in the reports of bad PHS through all the five waves of NIDS has been observed in this study. The question that stands is, is this stability true stability or is it a result of reporting behaviours? With a high prevalence of depression in this cohort, it would be expected that there would be a high prevalence of bad PHS.

It is known that socio-demographic factors have an effect on general health and well-being with being of low socio status having a negative impact on health. The results of this study have shown a similar outcome, having higher socio-demographic status (completing secondary and tertiary education and being employed) has been positively associated with reporting having good PHS. It is possible that differences in socio-demographic status could result in PHS not being able to fully and accurately capture bad health. Furthermore, the results showed that depressed individuals were less likely to report having good PHS suggesting that depression modifies an individuals' reporting of PHS.

The PHS question used in NIDS and in some other studies globally, "How would you describe your health at present? Would you say it is excellent, very good, good, fair, or poor?", is not only vague but it lacks a common reference point on which to answer this question. In a country with diverse culture and a history of apartheid such as South Africa, one would expect several reference points in answering the PHS question as a result of different norms and values among races. The PHS question does not clearly specify what is meant by overall health, leaving the respondent to decide for themselves what criteria to use in providing an answer. The proclivity to use a particular referent

may not be distributed randomly in the population (Fayers and Sprangers, 2002; Krause and Jay, 1994).

Formulating a systematic and standardized self-reported subjective health assessment has been said to be important. Such an assessment can be used as a valid measure of health in epidemiologic research and, with some reservations, in population health monitoring (Miilunpalo, Vuori, Oja *et al.*, 1997; Resnick, Catalano, Sawyer *et al.*, 2012). To make PHS a more standardized measure, I suggest that sub questions based on specific reference points are formulated. These sub questions are to collectively assess subjective health. Some of the reference points that respondents use when answering the PHS question include thoughts about specific health problems, physical functioning or health behaviours (Krause and Jay, 1994).

Latent health status and reporting behaviours have been conceptualised as the two components of PHS (Patrick and Erickson (1993) cited in Layes, Asada and Kephart (2012)). Layes, Asada and Kephart (2012) operationalize latent health as a measure of health-related quality of life (HRQL), and the systematic deviation from PHS as a measure of reporting behaviour. The authors further state that HRQL measures are preference-based, but those preferences are different from reporting behaviour observed in PHS (Layes, Asada and Kephart, 2012). The preferences expressed in reporting behaviour in PHS are unique to the individual, while those incorporated into the HRQL are standardized population preferences assigned to health states. The HRQL measures thus remove individual variation in preferences by substituting a community standard (Layes, Asada and Kephart, 2012). The impact of health conditions on individuals' physical, social and emotional well-being cannot be separated from the context of how it affects their lives, and in this sense reporting behaviour can reflect differences in health (Jylhä, 2009). The low prevalence of bad PHS in this study cohort suggests that young people feel healthy regardless of the high burden of disease in South Africa. On the other hand, the reporting of good PHS among young people in this cohort has been found to be affected by education level completed and employment status.

5.1.8 Well-being of South African Youth

The South African population is quite young with about 30% (17.84 million out of 58.78 million) of the entire population consisting of youth (aged 14-35) (Statistics South Africa, 2019). It is a cause for concern to have a high prevalence of depression in a significant percentage of the population considering the crippling effects that depression

has. The effects of depression that include suicide, physical and sexual violence, drug and alcohol abuse and promiscuous sexual behaviour (The South African Depression and Anxiety Group, 2019) are detrimental for well-being and for development. In a country already troubled with a high burden of disease and high levels of crime, it is of importance to give special attention to curbing depression among young people.

One of the priority issues for youth is full and effective participation in the life of society and in decision making (United Nations Department of Economic and Social Affairs). Having a high prevalence of depression suggests that youth are less likely to use their potential and make meaningful contributions to the development of their society. With depression being ranked fifth on the top ten causes of disability in South Africa in 2010 and 2017 (Institute for Health Metrics and Evaluation, 2019; Neethling I, Pillay-van Wyk V, Joubert J *et al.*, 2017), prioritizing the well-being of young people could increase their productivity in society and their life expectancy.

5.1.8.1 Policy environment and existing programmes to help address physical and mental well-being

South African youth have been said to be uneducated, unemployed and unemployable (Statistics South Africa, 2019). These are among the factors that increase chances of depression and reduce chances of reporting good PHS. Efforts towards education and employment of young people need to be increased and placed as priority on National agenda so as to avoid mental and behavioural disorders which have been found to have massive disruption in the lives of those who are affected and their families (World Health Organization, 2001). There exists national and international policies and legislature including sustainable development goals which lobby for the well-being of young people and could be used directly or indirectly to address the high levels of depression and achieve overall well-being for young people.

An examination of the history and current state of child and adolescent mental health (CAMH) policy development and implementation and a systematic analysis of all available CAMH service-related policies revealed that no South African Province had a CAMH policy or identifiable implementation plans to support the national CAMH policy (Mokitimi, Schneider and de Vries, 2018).

Lund, Brooke-Sumner, Baingana *et al.* (2018) suggest that it is important to address underlying socio-demographic determinants of mental health as these have been found to strongly determine mental disorders in populations. Further, the authors suggest the need to increase efforts towards achieving the sustainable development goals that are relevant to the underlying causes of well-being.

5.1.9 Limitations

While socio-economic factors play an important role in predicting depression and PHS, it should be acknowledged that behavioural factors too could play a role in these outcomes. Behavioural factors are factors associated with numerous lifestyle habits such as obesity, smoking, physical inactivity and risky alcohol consumption (Linardakis M, Papadaki A, Smpokos E *et al.*, 2015). This was not investigated and could be considered as an avenue for future research. Similarly, the effect of disabilities and specific health conditions for example, HIV/AIDS, Tuberculosis and hypertension on depression and PHS were not investigated and could be considered for future studies.

Attrition in the NIDS data in waves two to four was said to have been high among Whites and Indian/Asian and among high-income respondents (Brophy, Branson, Daniels *et al.*, 2018). The results of attrition include reduced sample sizes and biased findings. This study made use of an unbalanced panel taking into consideration all adults in the cohort of interest. Using an unbalanced panel increased the sample size thereby increasing the robustness of the findings. Significant distortions in the percentage distribution by race would be an indication of under representation of a particular race thereby causing a bias in findings. For the cohort that was studied, the percentage distribution of the sample by race stayed almost the same through all the five waves of NIDS.

This study made use of self-assessed income (relative income) regardless of the actual earnings of the household. This reduced the chances of bias in the event that high-income respondents (amongst whom attrition was said to be high) were underrepresented. However, one of the challenges of using self-assessed income is that it is subjective and not objective. This means that an individual may see themselves to be an income class that they are not actually in. If actual income is low, it would be expected that spending on health would be low too, but perceived income cannot convey this. Therefore, it would be expected that a different measure of income could produce different results.

Depression is said to affect one's ability to function well which could make depressed people less likely to participate in the survey. This may have reduced the estimates of the prevalence of depression in this study. However, this cannot be quantified as the respondents have dropped out already.

5.2 Conclusion

This study was conducted using data from the South Africa NIDS waves 1-5 with the aim of exploring depression and PHS, their socio-demographic determinants, as well as to examine the potential modifying effect that depression has on PHS among a cohort of young people.

The findings of this study showed that there is a high prevalence of depression and a low prevalence of bad PHS. The high prevalence of depression in this study calls for urgent attention to factors that protect the well-being of young people. The results further showed that individuals who had completed secondary or tertiary education had higher odds of having good PHS and lower odds of being depressed than those who had not. Employed individuals had higher chances of having good PHS and lower chances of being depressed in comparison to those who were economically inactive. These results are consistent with those from Statistics South Africa (2004) (of course bearing in mind that the age cohorts looked at are different) and with those from the study by Alvarez-Galvez, Rodero-Cosano, Motrico *et al.* (2013) which revealed that social and economic circumstances have an impact on physical and mental health. Completion of secondary and tertiary education and being employed have been found to protect individuals from being depressed. These factors have also been found to increase the odds of having good PHS.

It was suggested that the standardization of PHS will make it a better measure of population well-being (Miilunpalo, Vuori, Oja *et al.*, 1997; Resnick, Catalano, Sawyer *et al.*, 2012). I suggest that the PHS question is made specific such that it addresses the different reference points that individuals use to answer the PHS question. This will reduce bias from differential reporting behaviours. The various reference points for PHS have been identified by Krause and Jay (1994) to be thoughts about specific health problems, physical functioning or health behaviours. These specific referents vary by age and could also vary by education and race.

I suggest that studies using PHS need to control for socio-demographic factors particularly education level and employment status as these have been found to differentially influence the reporting of PHS. In post-apartheid South Africa, the effects of inequalities arising from apartheid-era social and economic policies are still present as can be seen from the results obtained in this study. Even though discriminatory policies were abolished, the effect of social and economic structures on well-being remain.

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